SHOUT
SHARE
IT

f/62 2/3 7413

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

Vol. XXI 1926

SMITHSONIAN INSTITUTION
280164
APR 2 1927
NATIONAL MUSEUM

EDITED (IN SUCCESSION) BY

F. G. SCHAUPP JOHN B. SMITH GEO. H. HULST
CHAS. LOUIS POLLARD R. P. DOW
J. R. de la TORRE-BUENO

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, *Editor*
G. P. ENGELHARDT J. BEQUAERT

THE SCIENCE PRESS
PRINTING COMPANY
LANCASTER, PA.

INDEX TO VOLUME XXI.

(Arranged alphabetically throughout.)

Subjects and Authors.

GENERAL SUBJECT.

Book Notes: Bird Islands of Peru, J. R. T. B., 58.
Heteroptera or True Bugs of Eastern North America, J. R. T. B., 204.
Editorials: Entomologica Americana, 130.
Among Those Not Present, J. R. T. B., 130.
Ernst Evald Bergroth: Master Hemipterist (1857–1925), H. M. Parshley, 15.
John Cassimir Wright, Geo. P. Engelhardt, 128.
Proceedings of the Society, Charles Schaeffer and E. L. Bell, 132, 171, 206.
The Blood of Insects, Vernon L. Haber, 61.

COLEOPTERA.

About Some Newcomers, F. M. Schott, 17.
A May Beetle with the Pronotum Showing a Complete Median Division, Robert D. Glasgow, 40.
A New and Remarkably Large Species of *Eupagoderes,* F. H. Chittenden, 169.
Note on the Blister Beetle *Macrobasis murina* Lec., 118.
Note on *Coccinella oculata* Fab., F. H. Chittenden, 37.
Note on Collecting *Eleodes hispilabris nupta* Say, R. H. Beamer, 39.
Palaeocoleopterology, Melville H. Hatch, 137.
Tillyard on Permian Coleoptera, Melville H. Hatch, 193.
Two New Names and a Correction in Synonymy, H. C. Fall, 125.

DIPTERA.

A New Species of Sapromyzidae from China, J. R. Malloch, 176.
Diamesa (*Psilodiamesa*) *lurida* Garret, O. A. Johannsen, 205.
The External Anatomy of the Primitive Tanyderid Dipteran *Macrochile spectrum* Loew, preserved in Baltic Amber, G. C. Crampton, 1.
Undescribed Species of the Genus *Limnophila* from Eastern North America, Charles P. Alexander, 109.

HETEROPTERA.

A Biological Note on the Pterygopolymorphism of *Aradus,* Teiso Esaki, 29.
A New *Geocoris* from Illinois, H. G. Barber, 38.
An Undescribed Tingitid from Arizona, Carl J. Drake, 126.
Description of a New *Renodaeus* from Texas, H. H. Knight, 56.
Descriptions of Eleven New Species of *Phytocoris* from Eastern North America, H. H. Knight, 158.
Descriptions of Nine New Species of Bryocorinae, H. H. Knight, 101.
Descriptions of Seven New Species of *Pilophorus,* H. H. Knight, 18.
Further on Annectant Bugs, W. L. McAtee and J. R. Malloch, 43.
Further Records of Heteroptera from Massachusetts, J. R. de la Torre-Bueno, 53.
Kentucky Heteroptera New to the State, J. R. de la Torre-Bueno, 190.
Limnometra skusei: A New Name, J. R. de la Torre-Bueno, 129.
On Some Heteroptera from the Canal Zone, collected by J. G. Sanders, J. R. de la Torre-Bueno, 108.
Remarks on the Linnean Species of *Nepa* and *Laccotrephes,* Teiso Esaki, 177.
Some New Records of Aquatic Heteroptera from Northern Michigan with the Description of Seven New Corixidae, H. B. Hungerford, 194.
Some Remarks, al Vuelo, on Tingitid Names, J R. de la Torre-Bueno, 116.

HOMOPTERA.

An American Species of the Genus *Pachypappella* Baker, Alice P. Macdougall, 119.
A Correction (in Membracidae), Z. P. Metcalf and C. S. Bruner, 28.
Some Interesting Cicadellid Papers, Chris. E. Olsen, 185.

HYMENOPTERA.

A New Species of Sphecodes from the Belgian Congo, R. Meyer, 191.
Descriptions of North American Species of *Pristaulacus* Kieffer, J. Chester Bradley, 173.
Notes on the Belytinae with Descriptions of New Species from the State of New York, Robert M. Fouts, 145.
Wasps and Bees as Water-Straddlers, Wm. T. Davis, 127.

LEPIDOPTERA.

About Some Newcomers, F. M. Schott, 17.
A Correction in Aegeriidae, Geo. P. Engelhardt, 14.
Additional Records of the Distribution of Some North American Hesperiidae, E. L. Bell, 192.
A New Locality for *Thanaos tristis* Boisduval, E. L. Bell, 184.
Collecting Notes from Long Island, E. L. Bell, 202.
Early Butterflies, D. Prescott Rogers, 42.
Melitaea harrisi Scudder from Long Island, N. Y., Geo. P. Engelhardt, 157.
New Long Island Lepidoptera Records from a White Cedar Swamp, Geo. P. Engelhardt, 187.
Notes on Aberrations of New Jersey Butterflies, Chas. Rummel, 203.
Observations on the Propagation and Behavior of *Telea polyphemus,* Chas. Rummel, 156.
On the Placement of the Names *caduca* and *retis,* Wm. Barnes and F. H. Benjamin, 182.
Periodical Swarming of *Celerio lineata* in Ecuador, Geo. P. Engelhardt, 27.
Remarks on *Megistias neamathla* Skinner & Williams, E. L. Bell, 184.
The Morphological Significance of the Juxta in the Male Genitalia of Lepidoptera, John R. Eyer, 32.
Three Rare Butterflies from Long Island, N. Y., E. L. Bell, 26.

THE MINOR ORDERS.

A New Mayfly from Peru, T. D. A. Cockerell, 189.
Observations on Polygamous and Supposedly Cannibalistic Insects of the Order Orthoptera, Chas. Rummel, 144.
The Life History and Habits of *Eremochrysa punctinervis* McLach., Roger C. Smith, 48.

INDEX TO GENERA AND SPECIES OF INSECTS AND PLANTS.

New forms in **bold face**; valid genera and species in Roman; synonyms in *italics;* * indicates plants; † Long Island records.

(For records of Heteroptera from Massachusetts, see pp. 53–56; for records of Kentucky Heteroptera, see pp. 191–192; for records of Texas Hesperiidae, see p. 192; for genera of fossil Coleoptera, see pp. 139–144. Genera and species mentioned therein not indexed.)

Acalypta thomsonii, 117
  madelinae, 117
* Acer saccharinum, 17
Aclista americana, 145
  arcuata, 145
  caudata, 145
  crassicornis, 145
  dolichoneura, 146
  emarginata, 145
  excavata, 146, 147
  insignis, 145
  levistylus, 145
  microneura, 145
  nevadensis, 145
  obliterata, 146, 147, 149
  palustra, 145, 146
  scleroneura, 146
  simulans, 146, 148
Acontia, 183
  luctuosa, 183
  solaris, 183
Agapema galbina, 27
Agrilus felix, 125
  illectus, 125
  implexus, 125
  jacobinus, 125
Agrophila, 183
Alcathoe pepsioides, 14
Alcecoris, 46
Alepidia gracilis, 25
  var. **squamosa**, 26
* Amaranthus, 48
Anoplius illinoiensis, 127
Anosia plexippus, 66
Aphodius subterraneus, 17
Aradus, 29 et seqq.
  betulae, 30
  cinnamomeus, 30, 31
  consentaneus, 30
  corticalis, 30
  depressus, 30
  lugubris, 30
  melas, 30
Arctocorixa decorata, 196
  decoratella, 195
  douglasensis, 196
  hydatotrephes, 199
  macropala, 196
  michiganensis, 197
  minor, 197
  minorella, 196
  nitida, 197
  solensis, 198
  variabolis, 198

† Baileya dormitans, 208
Balaninus proboscideus, 208
Belyta californiae, 145
  floridana, 145
  insularis, 150
  klagesi, 149
  missouriensis, 145
  rugifrons, 149
  rugosopetiolata, 145
Benacus griseus, 179
* Betula populifolium, 17
Blatta orientalis, 71
Blatella germanica, 63 et. seqq.

Blasturus, 32
    cupidus, 35
Boreus brumalis, 35
Brachycentrotus, 28
Brachycentrus, 28
Bruchomyia, 5 et seqq.
Bulaea lichatschovi, 17

Callibaetis, 190
Calosoma wilcoxi, 132
* Caragana sp., 118
Carpocapsa pomonella, 65
Celerio lineata, 27
Celtiphaga clyton, 202
Ceratocapsus, 57
† Ceruchus piceus, 208
* Chamaecyparis thyoides, 187
Chaulatops agavis, 101
    barberi, 101
Chauliognathus, 65, 66, 81
Chrysobothris, 125
Chrysopa cockerelli, 50
    plorabunda, 50
    quadripunctata, 50
* Chrysothamnus, 25
Chytonix chlorostigma, 134
Cicada, 207
Cinetus, see Xenotoma, 150
Cimex lectularius, 58
* Clematis ligusticifolia, 14
Coccinella oculata, 37
Coccivora, 45
Coloradia pandora, 134
Corizus sidae, 108
Ctenucha virginica, 35
Cyllene robiniae, 65, 66, 81
† Cynthia atalanta, 202
    † cardui, 202
    † virginiensis, 202
Cyrtocapsus caligineus, 102
    var. **aureopubescens,** 102

Deleatidium, 190
Delphax dispar, 29
Diamesa (Psilodiamesa) lurida, 205
Diapheromera femorata, 144
Diphleps unica, 46
* Doellingeria umbellata, 157
Doru aculeatum, 17
Doryphora clivicollis, 66
Dysdercus atratus, 108
    obliquus, 108
    peruvianis, 58
    ruficollis, 58

Ecdytalopha insiticiana, 66
Eleodes hispilabris nupta, 39
Emmelia, 183
Emphor bombiformis, 127
Epargyreus tityrus, 66, 208
Ephelia, 109
Epilachna borealis, 17
Erannis tiliaria, 133, 135
Erastria, 182
Eremochrysa punctinervis, 48 et seqq.
Erotyla trabelis, 183
Euchaeitas egle, 66
Eupagoderes desertus, 169
    giganteus, 169
    prolatus, 170
† Euphyes dion, 188
† Eurymus eurytheme, form amphidusa, 26, 202
    † philodice, 202
    ab. rothkei, 26
Eustrotia immista dissimilaria, 183
    uncana, 183
† Euthyatira pudens, 208
† Exyra rolandiana, 188

Formica fusca, 120

Gastrophilus, 69
Geocoris **frisoni,** 38
    uliginosus, 39
    ventralis, 58
Gerris, 31
* Gleditsia triacanthos, 20
Gnorimus maculosus, 135

Gortyna, 182
    flavago, 183
    reniformis, 183
Gypona octolineata, 135
Gyrinus confinis, 141

Hadena diversicolor, 134
Halobates, 30
† Hamadryas antiopa, 202
Helotropha caduca, 182, 184
        form retis, 182, 184
Hepialus lupulinus, 35
Heterocoris **cyaneus,** 103
    dilatatus, 103
Homoneura **chinensis,** 176
    grandis, 176
Hydrometra australis, 129
    lineata, 129
Hypselonotus atratus, 108

Idiotropus, 43, 45
Ignotus aenigmaticus, 135

Laccotrephes fuscus, 181
    kohlii, 181
    ruber, 177 et seqq.
† Lemonias harrisi, 203
Leptodyctia bambusae, 127
    nicholi, 126, 127
    plana, 126, 127
    simulans, 127
    tabida, 126, 127
Leptophlebia volitans, 35
Lidopus, 46
Liburnia pellucida, 30
Limnometra opaca, 108
    skusei, 129
Limnophila (Ephelia) aprilina, 109, 110
        serotinella, 110
        solstitialis, 109 et seqq.
    (Phylidorea) adjuncta, 112
        adusta, 114
        auripennis, 113
        nigrogeniculata, 114
        novae-angliae, 112
        platyphallus, 111
        terrae-novae, 112
Lithacodia apicosa, 184
    bellicula, 184
Lytta, see Macrobasis, 118

Macrobasis murina, 118
Macrochile spectrum, 1 et seqq.
Madura perfida, 108
Magicicada, 207
Mallochiola, 45
Mamestra assimilis, 134
Megistias fusca, 184
    neamathla, 184
Megaxyela, 32, 35
Melanorhopala clavata, 116
    lurida, 116, 117
    uniformis, 116, 117
† Melitaea harrisi, 157
Melipotis nigrescens, 132
Melitoma taurea, 127
Merope tuber, 35
Metrocoris, 29
Micromus, 189
Microphysa tenella, 45
Miota, see Xenotoma, 150
Molanna angustata, 35
Montina nigripes, 108
Myrmedobia, 45

Nabidomorpha, 45
Nemopalpus, 5
Nepa apiculata, 184
    atra, 177
    cinerea, 177
    fusca, 177
    kohlii, 179
    rubra, 177 et seqq.
Neuronia, 34
    postica, 35
Noctua fibrosa, 183
    unca, 183
Norape tener, 35

Notiophilus aquaticus, 125
  obscuratus, 125
  obscurus, 125
Notonecta borealis, 194, 195
  insulata, 195
  irrorata, 194, 195
  lunata, 195
  variabilis, 195
Nousia, 190
* Nuphar advena, 182
Nusulala escomeli, 189
Nysius spurcus, 58

Ochria, 183
  buffaloensis, 134
Oenetus rubroviridans, 172
  virescens, 172
Okanagana, 207

Pachypappa, 19
  grandis, 119
  vesicalis, 19
Pachypappella **caudelli,** 120
  lactea, 119 et seqq.
Pantoclis, see Xenotoma, 150
  insularis, see Belyta
† Papilio troilus, 208
† Papaipema appasionata, 188
  † inguaesita, 188
Paratenodera sinensis, 144
Peritropis, 46
Phalaena uncana, 183
Philhydrus *elongatulus,* 125
  sublongus, 125
Philopotamus, 35
Phlebotomus, 5
Phryganea, 34
Phyciodes nicteis ab. milburni, 203
  † tharos, 203
Phylidorea, 109
Phyllophaga ilicis, 41
Phytocoris **albifacies,** 159
  albitylus, 161
  angustifrons, 164, 165
  balli, 167
  borealis, 158
  buenoi, 163
  conspersipes, 165
  corticevivens, 159, 160
  davisi, 159
  dimidiatus, 158
  exemplus, 163
  eximius, 161
  fumatus, 159
  husseyi, 161, 162, 163
  lineatus, 160
  obtectus, 161
  oppositus, 160
  pinicola, 164
  puella, 166
  rubellus, 166
  rufus, 165
  salicis, 161
  schotti, 161
  signatipes, 164
  taxodii, 165
* Picea excelsa, 20
Pieris rapae, 207
Pilophorus **australis,** 21
  brunneus, 21
  buenoi, 18
  clavatus, 24
  crassipes, 19
  exiguus, 23
  geminus, 22
  heidemanni, 18
  fuscipennis, 23
  opacus, 24
  perplexus, 21, 22
  piceicola, 19
  nasicus, 18
  strobicola, 19, 20
  uhleri, 19
  vanduzeei, 19
  walshii, 20, 21, 22, 24
* Pinus edulis, 24
  * resinosa, 26
  * strobus, 17, 19
† Poanes massasoit, 188

  † viator, 202
Podops cinctipes, 171
Polistes rubiginosus, 127
† Polygonia interrogationis, 202
* Populus tremuloides, 120
  * trichocarpa, 120
Pristaulacus (Oleisoprister) flavipes, 174, 175
  glabrescens, 174
  stigmaterus, 174
  taughanic, 173, 174, 175
Protoplasa, 7 et seqq.
† Psaphidia resumens, 208
Pseudocleon, 190
Psilodiamesa, see Diamesa
Ptychoptera, 5
Pycnoderes **balli,** 104
    var. **obscuratus,** 105
  dilatatus, 105, 106
  drakei, 106
  incurvus, 105, 106
  infuscatus, 106
  medius, 105, 106
  quadrimaculatus, 104, 105
Pyralis farinalis, 35

* Quercus ruber, 16

Ranatra fusca, 195
  nigra, 195
  protensa, 195
Renodaeus ficarius, 56
  texanus, 56
Rhyncospilus conica, 145
* Robinia pseudo-acacia, 66

Sabatinca chrysargyra, 35
* Sagittaria, 182
* Salix, 2
  * longifolia, 167
* Sarracenia purpurea, 188
Schizoneura reaumuri, 119
Sinea caudata, 108
Sixeonotus **albohirtus,** 107
  brevis, 107
  insignis, 103
  tenebrosus, 107, 108
* Solidago canadensis, 66, 67
Spaniophlebia **escomeli,** 189
  pallipes, 189
  trailiae, 189
Sphecodes **bequaerti,** 191

Talaeporia tabulosa, 35
Tanyderus, 2 et seqq.
  forcipatus, 6
Taxodium distichum, 163, 167
Teratodia emoritura, 46
Telea polyphemus, 144, 156
Tetracha carolina, 140
Tetraopes tetraophthalmus, 66
Thanaos tristis, 184
    form tatius, 184
Thylodrias contractus, 135
Tibicina, 207
Tortrix politana, 35
Trirhabda, 65, 66, 81
* Typha, 171

Vanessa atalanta, 132
  cardui, 132
† Vespa maculata, 207

Westermannia, 184
Wetmorea, 46
* Woodwardia virginica, 188

Xanthoecia buffaloensis, 183
  flavago, 183
Xenotoma **antennalis,** 152, 154, 155
  bakeri, 151, 152
  borealis, 150, 152
  castanea, 152
  clarimontis, 151
  clinoneura, 150
  coloradensis, 150
  curvicaudis, 152, 155
  flavinervis, 151, 152
  flavipes, 150, 151, 153

fungicola, 151, 152
fuscicornis, 151
fuscinervis, 151, 152
insularis, 150, 152
kiefferi, 152
klagesi, 152
laeta, 150
macrodyctium, 150, 152
mandibularis, 152
megaplasta, 151
melanocera, 150
palustra, 151, 153
parvicellula, 150, 151
pilosa, 150, 153
ruficornis, 150, 152
rufopleuralis, 150, 152
rufosignata, 151, 152
scutellata, 150, 152
similis, 150, 152
trisulcata, 151
xanthopus, 152, 153
† Xylotrechus quadrimaculatus, 133

Zelotypa, see Xenotoma, 150
Zerene caesonia, 26

New Genera in this Index, 1.
New Forms in this Index, 64.

DOUBLE NUMBER

XXI FEBRUARY-APRIL, 1926 Nos. 1 & 2

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

SMITHSONIAN INSTITUTION
MAY 7 1926
NATIONAL MUSEUM

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 70 cents Subscription, $1.50 per year

Mailed May 4, 1926

Entered as second-class matter January 21 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1926

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
E. L. BELL

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
G. P. ENGELHARDT

CONTENTS

EXTERNAL ANATOMY OF MACROCHILE SPECTRUM, FROM BALTIC AMBER, Crampton 1
CORRECTION IN AEGERIIDAE, Engelhardt 14
ERNST EVALD BERGROTH, Parshley 15
ABOUT SOME NEWCOMERS, Shott 17
SEVEN NEW PILOPHORUS, Knight 18
THREE RARE BUTTERFLIES FROM L. I., Bell 26
SWARMING OF CELERIOLINEATA IN ECUADOR, Engelhardt 27
CORRECTION IN MEMBRACIDAE, Metcalf and Bruner 28
BIOLOGICAL NOTE ON PTERYGOPOLYMORPHISM OF ARADUS, Esaki 29
MORPHOLOGICAL SIGNIFICANCE OF JUXTA IN MALE LEPIDOPTERA, Eyer 32
NOTE ON COCCINELLA OCULATA, Chittenden 37
NEW GEOCORIS FROM ILLINOIS, Barber 38
COLLECTING ELEODES HISPILABRIS NUPTA, Beamer 39
MAY BEETLE WITH PRONOTUM SHOWING MEDIAN DIVISION, Glasgow 40
EARLY BUTTERFLIES, Rogers 42
FURTHER ON ANNECTANT BUGS, McAtee and Malloch 43
LIFE HISTORY AND HABITS OF EREMOCHRYSA PUNCTINERVIS, Smith 48
HETEROPTERA FROM MASSACHUSETTS, Bueno 53
TO OUR SUBSCRIBERS 55
NEW RENODAEUS FROM TEXAS, Knight 56
BOOK NOTE—BIRD ISLANDS OF PERU, J. R. T. B. 58

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXI February–April, 1926 Nos. 1 & 2

THE EXTERNAL ANATOMY OF THE PRIMITIVE TANYDERID DIPTERAN MACROCHILE SPECTRUM LOEW, PRESERVED IN BALTIC AMBER.

By G. C. Crampton, Ph.D., Massachusetts Agricultural College, Amherst, Mass.

Through the kindness of Frau Dr. Richard Klebs, Fraulein Dr. Elizabeth Skwarra, and Professor Dr. K. Andreé, the amber Tipulids of the Klebs Collection, and those of the Koenigsberg Geological Institute, were recently sent to Dr. C. P. Alexander for study; and in this material were practically all of the known specimens of the extremely interesting and primitive Dipteran *Macrochile spectrum* Loew. Since there were enough specimens of *Macrochile* for me to be able to make out, in some of them, all of the main features of both sexes, I was delighted to accept Dr. Alexander's suggestion that I make a detailed study of the external features of this interesting and important insect, which has departed but little, in many respects, from the condition characteristic of the ancestral Diptera.

One would have to do considerable " restoring " in attempting to reconstruct the external form of the fossil three- and four-toed horses (such as *Protorohippus, Epihippus* and *Mesohippus*) and other extinct Mammalian contemporaries of *Macrochile* in the upper Eocene and lower Oligocene epochs (calculated at between thirty and forty million years ago by Dr. A. C. Lane) ; but since the hard parts of *Macrochile* are external, and since the imprisoning and preserving gum in which the specimens were imbedded has hardened into a transparent mass, which is beautifully clear in the fine mounts from the above-mentioned collections, it is possible, with a little manipulation, to make out all of the external details of both sexes, in the long-extinct *Macrochile*—and in examining such well-preserved material, it is indeed difficult to realize that one is not dealing with balsam mounts of recently collected specimens! In spite of the excellent preservation of these insects, however, I do not know of any serious attempt to figure all of the essential external features of both sexes of any fossil insect whatsoever, and on this account it may be of some interest to present the principal external features of both sexes of this primitive Dipteran, which is in many respects one of the most interesting and important representatives of the order thus far known.

As is shown in Figs. 2 and 3, the males of *Macrochile* are holoptic, and the females are dichoptic. Dr. Alexander has called my attention to the fact that hairs occur between the facets of the ommatidia of the compound eyes in all Tanyderids, and he also called my attention to the presence of such hairs between the facets of the eyes of *Macrochile,* thus adding further proof to that from other sources indicating that *Macrochile* is a true Tanyderid—though it is very like the common ancestor of the Psychodids, Tanyderids, and Ptychopterids in some respects. In fact, *Macrochile's* thoracic structures are so annectant between those of the three other families mentioned that I have no hesitancy in grouping the Psychodids, Tanyderids and Ptychopterids in a single superfamily, the Psychodoidea, following a suggestion made by Dr. Edwards (see Crampton, 1926).

As in all other Psychodoids, the ocelli are wanting in *Macrochile.* The antennae are composed of nineteen segments in both sexes, and are much like those of *Tanyderus.* In the antenna of the female *Macrochile* shown in Fig. 13, the postpedicel *ppd,* or third segment of the antenna, is unusually long, and gives the appearance of being the fusion product of two segments. In the antennae of this female, however, there were nineteen antennal segments as in the antennae of the males, which have a shorter postpedicel (Fig. 14, *ppd*), so that the abnormally long postpedicel of the female shown in Fig. 13 is apparently not the result of the fusion of two antennal segments. The proportions of the other segments of the antenna do not differ greatly in the two sexes, so that Fig. 13 will serve to illustrate a typical antenna, with the exception of the segment labelled *ppd.*

The heads of the females shown in Figs. 1 and 3 are somewhat "foreshortened," since I was unable to see the heads properly (due to the refraction of light when the surfaces of the amber were turned at too great an angle to the source of illumination) when the amber blocks were tilted enough to bring the heads into a horizontal plane, in looking at them from above, so that the mouth-parts are not represented as long as they should be in proportion to the breadth of the head. On the other hand, the base of the proboscis is usually retracted within the mentum bearing the label *mn* in Fig. 1, in *Macrochile,* as in other Tanyderids, and in the male *Macrochile* shown in Fig. 2, the proboscis is unusually extended.

In an article dealing with the labium of the Holometabola (Crampton, 1925), I have given a figure (Fig. 3 of the paper in question) of the labium of *Tanyderus,* with which the labium of *Macrochile* here shown (Fig. 1) may be compared. In *Macrochile* (Fig. 1), the labella *lbl,* or modified distal segments of the labial palpi, are rather sharply demarked from the basilabella *blb,* or basal segments of the palpi, in the ventral view of the labium shown in Fig. 1; but in the lateral view of the labium shown in Fig. 2, the basal segments of the palpi are not very clearly demarked, due to the rather poor condition of the specimens showing this aspect of the labium. As may be seen in Figs. 2 and 17, the labella *lbl* form a trough into which the labrum *lr* may lie—or its distal portion, at least, is usually overlapped by the labella laterally. The region *pgr* of the underlip of *Macrochile* (Fig. 1) represents the united palpigers; and the incomplete suture between the palpigers of *Tanyderus* has almost completely disappeared in *Macrochile,* in which barely the faintest trace of it can be detected if the lighting is " just right " to bring it out. The elongated sclerite bearing the labels *mn* and *sm* in Fig. 1, represents the united mentum and submentum (and is probably largely composed of the mentum) as was pointed out by Crampton, 1925; and in *Macrochile* this sclerite is somewhat broader, and therefore more primitive, than in the labium of *Tanyderus* shown in the paper mentioned above. The labium of *Macrochile,* as a whole, is more primitive than that of *Tanyderus,* and it is possible that the small area at the bases of the sclerites labelled *blb* in Fig. 1, represent traces of the missing third, or true basal, segment of the labial palpi; and if this is the case, *Macrochile* has preserved the rudiments of the basal segments of the labium which are completely lost in every Dipteran I have examined. There were some indications of a thickening and deposit of pigment in the area labelled *gu* in Fig. 1, which might be interpreted as a tendency to form a gular region in *Macrochile.*

Due to the fact that there was a great deal of refraction of light when the blocks of amber were tilted at a sharp angle to the rays of light from the lamp used to illuminate the field of the dissecting microscope, I could make out practically nothing of the maxillary structures excepting the maxillary palpi *mxp* of Figs. 1, 2, and 3. The maxillary palpi appear to be composed of five segments, although it is possible that the small basal segment may represent the palpifer. I am more inclined to think that the palpifer is contained in the region at the base of the segment in question, however, so that the maxillary palpi are probably five-segmented.

As is shown in Fig. 17, the labrum *lr* (which probably represents the so-called labrum-epipharynx) is bent somewhat, so as to lie at a different level from that of the fronto-clypeus *fc*. The region labelled *fc* in Figs. 2 and 3, probably represents the united frons and clypeus, and is therefore referred to as the frontoclypeus, although it would perhaps be simpler to call it simply the frons. Behind the region *fc* in Fig. 3 is a bridge-like area, which is not clearly seen in most specimens. This area separates the frons *fc* from the parietal region *pa* usually referred to as the vertex. Posterior to the parietal region *pa* is the small occiput *oc* or "nape," which is extremely difficult to make out in the specimens available to me.

On each side of the occiput *oc* of Fig. 3 is a bulging structure *alc* (see also *alc* of Fig. 2) which probably represents the sclerite called the precervicale, or anterior lateral cervical plate, in other Diptera. This area is somewhat larger than in other Tanyderids, and is rather imperfectly chitinized and pigmented. The lateral cervical sclerite *lc* is somewhat smaller than it is in other Tanyderids (it is extremely elongated in *Tanyderus*) and I experienced considerable difficulty in making out the outlines of this sclerite in the specimens available to me, so that I am not entirely sure of its exact appearance, although it seemed to have an elongated anterior process (called the cephaliger) extending forward to the occipital condyles of the head. The appearance of the sclerites *lc* is better shown in Fig. 2 than in Fig. 1, since the parts were considerably distorted in the insect shown in Fig. 1, as is also the case in Fig. 3, in which the neck region is represented as though it were much broader than is the case with more normal specimens.

In Fig. 1 is shown the presternum *ps* or anterior sclerite of the prosternal region, and a portion of the second sternal plate, or basisternum, is labelled *bs* in Fig. 1. I could make out practically nothing else of the sternal region of the prothorax in my material, but by combining parts visible in several specimens, it was possible to reconstruct the lateral portions of all of the thoracic segments very satisfactorily, especially since I had been working on this part of the body in lower Diptera recently, and was therefore more familiar with the parts in closely allied forms, and could therefore tell what to look for in *Macrochile* to better advantage.

I have already discussed the thoracic structures of *Macrochile* in a paper which will soon be published (Crampton, 1926) dealing with the thoracic structures of the Psychodoidea in general. It will therefore not be necessary to do more than to call attention to some of the more interesting features of *Macrochile's* thorax, at this time. The pronotum *apn* and *ppn* of *Macrochile* (Fig. 5) is narrower than that of the other Tanyderids I have examined, and in this respect *Macrochile* is intermediate between the rest of the Tanyderids and the Bruchomyine Psychodids, and it is much nearer the Ptychopterid type than is the case with the pronota of other Tanyderids. The same may be said of the rather elongated coxae and the more elongated (dorso-ventrally) thoracic contour of *Macrochile,* since in these respects *Macrochile* is intermediate between the rest of the Tanyderids and the Bruchomyine Psychodids (such as *Bruchomyia* and *Nemoplapus*), and it is approached by the thorax of *Ptychoptera* in this respect. The metanotum *mtn* of *Macrochile* (Fig. 5) is likewise intermediate in character between the Tanyderid type and the Psychodid type (exemplified by *Phlebotomus*). As is shown in Fig. 15, the metanotum *mtn* becomes narrowed mesally, as does that of the Psychodid *Phlebotomus,* while the lateral portions remain somewhat " oval " as in *Phlebotomus.*

In *Macrochile,* as in all other representatives of the superfamily Psychodoidea, the meron of the mesothoracic coxa unites with the lower portion of the mesothoracic epimeron to form the area *mpl,* of Fig. 5; and the suture *a* is incomplete as in all Psychodoids. As in all members of the Psychodoidea, there is a rather clearly demarked area *saf* in Fig. 5 of *Macrochile.* The well-known "V-shaped" suture familiar to all students of the Tipulids is incomplete in *Macrochile* (i.e., the suture labelled *s* in Fig. 5), and the metathoracic spiracle *sp* is very near the base of the halter in *Macrochile,* as in all of the Psychodoidea.

The relative lengths of the various segments of the legs are shown fairly accurately in Figs. 19 and 20, and there is nothing strikingly different in them from the structures to be found in *Tanyderus* and similar forms. It may be noted in passing, that there are two movable spines at the apex of the hind tibiae (Figs. 18 and 19); and the pulvilli, empodium, and other structures of this nature are undeveloped, as in most lower Diptera. The claws *un* of Fig. 16 are rather interesting, but do not differ markedly from those of *Tanyderus.*

Of the other thoracic appendages there remain to be considered only the wings and halteres. The venation, as is shown in Fig. 11, is of an extremely primitive type, and the character of the median veins would indicate that the view of Dr. Tillyard as to the four-branched character of media is the correct one. I have therefore adopted Dr. Tillyard's interpretation of the primitive Dipterous venation in homologizing the veins of *Macrochile* shown in Fig. 11, with the exception of the vein labelled *pa,* which Tillyard considers as the second branch of *Cu* in related insects, but which appears to be an intermediate vein, the preanal, regarded by some investigators as the first anal, by others as the second branch of *Cu.* I prefer to refer to it simply as the preanal vein, since its true relations to the other veins have not been definitely determined. I could not detect any connection between the base of this preanal vein and the cubital or anal veins, in *Macrochile,* but in *Tanyderus forcipatus* the base of the preanal vein seems to dip down to the first anal, although the vein is so faint in this region that I cannot be sure in the matter. The anal veins behind the large first anal were greatly reduced, and were very difficult to make out, but they seem to be of the general character of the veins behind the first anal in *Tanyderus,* so far as I can make them out. The longitudinal veins bear numerous macrotrichiae, but it would obscure the course of the veins to attempt to indicate the occurrence of the macrotrichiae, so that they have been omitted in the figure. I noted macrotrichiae on the membrane of the wing in several instances, but apparently these were detached macrotrichiae which chanced to come to rest upon the wing membrane before the gum hardened into amber.

Dr. Alexander has called to my attention the fact that the cross vein *m* (Fig. 11) is present in all Tanyderids, and that *Macrochile* is clearly an " out and out " Tanyderid on this account, although I was inclined to consider *Macrochile* as rather near the

Psychodid *Bruchomyia* because of the great similarity between the two in certain thoracic features, which, however, were not sufficiently important to outweigh the evident similarities between *Macrochile* and *Tanyderus* in the nature of the head, mouthparts, and other features.

In their general venational characters, *Bruchomyia* and the Tanyderids have so much in common, that Dr. Alexander formerly included *Bruchomyia* in the family Tanyderidae—although, of course, later studies have shown that *Bruchomyia* is a Psychodid. Dr. Alexander's grouping, however, apparently gave the hint to Dr. Edwards who suggested (*in litteris*) that the Psychodids (including *Bruchomyia*), Tanyderids and Ptychopterids should be included in a single superfamily; and as soon as I began the study of *Macrochile* (Crampton, 1926) the synthetic character of its thoracic sclerites at once convinced me that the Psychodids, Tanyderids and Ptychopterids intergrade and should be united in a common superfamily, the Psychodoidea. The venational evidence supports that of the thoracic sclerites, so that all of the structures thus far studied clearly indicate that the three families mentioned should be grouped in a single superfamily.

There are a few peculiar features in the venation of *Macrochile* which are difficult to interpret. Thus, the stub of a vein at the anterior end of the cross vein *r-m* is a very puzzling feature which is also present in specimens of *Bruchomyia, Tanyderus,* and *Protoplasa,* so that it may have some phylogenetic significance. A fold-like line in this region may indicate the beginning of the formation of the structure which develops into the so-called spurious vein in Syrphidae, and this matter would repay further investigation along these lines.

The stub of a vein projecting beyond (distally) the forking of *Sc* is another puzzling feature which I do not understand. It was present in one specimen of *Macrochile* but was absent in all of the other specimens examined. This stub may possibly represent the true first branch of *Sc,* and in that case, the vein I have labelled Sc_1 in Fig. 11 would be merely a cross vein. This suggestion is offered for what it is worth, since I have not been able to investigate the subject further.

The halter (Fig. 12) presents no features of especial interest, although the nature and location of the projection labelled *p* in Fig. 5 suggests that this structure may be the precursor of the so-called prehaltere or spatulate appendage in front of the base of the halter in Ptychopterids.

There are no features in the basal region of the abdomen requiring especial mention, save the fact that in the specimen shown in Fig. 15, the abdomen was bent sharply downward, exposing a rather large intersegmental membrane or conjunctiva *cnj,* which is of somewhat greater extent than in most Tanyderids.

The terminal structures are the most important parts of the abdomen, since these offer characters of specific value, and fortunately, it was possible to make out practically all of the structural details of both sexes in the material available to me. I have therefore given figures of the dorsal, lateral and ventral aspects of the male and female.

The eighth abdominal segment of the female (Figs. 6, 8, and 9) is not greatly reduced as is the case with the eighth segment of the male (Figs. 4, 7, and 10), and the eighth sternite of the female bears a pair of projections labelled *vv* in Figs. 8 and 9. From their position, one might infer that these projections represent the ventral valves of the ovipositor of lower Holometabola, but I am more inclined to consider them as the homologues of the valvular processes of the hypogynium, or subgenital plate of the female in other insects. I was unable to find similar structures in the females of *Tanyderus* or *Protoplasa,* and it is possible that *Macrochile* is the only Tanyderid in which they occur.

Another peculiar structure occurring in *Macrochile* is the structure labelled *mg* in Figs. 8 and 9. It would be interesting to trace the origin of this structure in order to determine if it has any relation to the dorsal valves of the ovipositor in lower Holometabola, although I doubt that any such relation exists, and it is more probable that the structure in question is merely an outgrowth of the sternal region.

The basal segments of the cerci labelled *bc* in Figs. 6, 9, and 8 are peculiar in shape, and bear rather sharply pointed ventral processes projecting posteriorly. If the structures labelled *bc* are not the basal segments of the cerci, they probably represent the paraprocts or parapodial plates, which are in reality modified basal segments of the cerci, although they are not usually recognized as such. If the structures labelled *bc* are the parapodial plates, the structures labelled *dc* are the cerci, instead of representing merely the distal segments of the cerci, as the labelling would indicate.

The precerci, or sclerites bearing the label *cg* in Figs. 6 and 8, possibly represent the tenth, or the united tenth and eleventh segments, but the homologies of the parts are not clear, and there is evidently considerable need of a thorough study of the terminal structures of both sexes of the Pterygota in general, beginning with the Orthopteroid forms, and including all of the higher types of insects as well.

The ninth tergite *epa* of the male (Figs. 7 and 10) is much larger than the ninth tergite of the female (Figs. 6 and 8), and the cerci of the male are apparently composed of but one segment, so that the structure labelled *bc* in Fig. 10 apparently corresponds to the structure labelled *bc,* alone, in Fig. 8. The anus-bearing structure *pg* is more easily seen in the male (Figs. 7 and 10) than in the female. It probably represents the eleventh segment, although this has not been definitely determined.

The gonostyli or stylus-like claspers of the male insects are usually composed of two segments in the Holometabola related to the Diptera. In the males of *Macrochile,* the basal segments or basistyles *bst* of Figs. 4 and 7 unite basally, or fuse with the neighboring parts as shown in Fig. 4. The dististyles or distal segments of the claspers labelled *ds* in Figs. 4 and 7 bear median projections and outgrowths which are of considerable interest.

As is shown in Figs. 4 and 7, the dististyles *ds* are forked, and the basal process *sap* probably represents the precursor of the basal or inner appendage of the dististyle in other Diptera, while the distal process *ap* probably represents the outer or apical appendage of the divided dististyle of other Diptera. The forking of the dististyle in *Macrochile,* therefore, probably foreshadows the division of the dististyle into an inner and outer appendage in other Diptera. Between the forks of the dististyle is a projection *iap* (Figs. 4 and 7) which is small and difficult to see clearly.

Since *Macrochile* is such a primitive Dipteran in many respects, I had hoped that the condition of the genital styles in it might give some hint of the nature of the genital styles in Diptera in general, but these structures are too highly modified even in *Macrochile* to be of much use in this respect. It is possible that the genital styles of the Holometabola related to the Diptera may not be homologous with the styli of Orthopteroid males, but the genital styles of these Holometabola may still be called gonostyli, since they are style-like appendages of the genitalia, and the true styli of male Orthopteroid insects might be differentiated from these by calling them androstyli, or simply styli.

The aedeagus *aed* of *Macrochile* (Figs. 4 and 10) appears to be bifid, or it is composed of two parts. Paired projections labelled *gap* in Figs. 10 and 7, flank a central structure which is very difficult to make out because the amber in this region is very much clouded (due to the inclosure of moisture, etc.) in all of the specimens examined. The structures labelled *gap* in Figs. 7 and 10, are provisionally termed the "gonapophyses," although this designation is not as appropriate as certain other terms applied to similar structures.

From the foregoing discussion, it is quite apparent that a detailed study of the external morphology of insects preserved in amber can be made with considerable accuracy and ease, and it is to be hoped that more of the amber insects will be figured in detail, so that their principal anatomical features may be made available for comparison with the structures of living forms, since the amber insects are in many instances more primitive than recent insects; and when they represent synthetic types, as is the case with *Macrochile,* the study of their anatomy is of the greatest interest and importance from the standpoint of phylogeny.

BIBLIOGRAPHY.

Alexander, 1920. A New Subfamily of Tanyderid Flies. Ann. Ent. Soc. America, 13, pp. 402–405.

Crampton, 1925. The Labium of Holometabola, with Particular Reference to the Diptera. Proc. Ent. Soc. Washington, 27, pp. 68–91.

Crampton, 1926. The Thoracic Sclerites of the Tanyderidae, Psychodidae, etc. Ent. News, 37, No. 2, Feb., 1926.

Loew, 1851. Beschreibung einiger neuen Tipularia terricola. Linnaea Entomologica. Zeitschr. Ent. Ver. Stettin, 5, pp. 385–406 (p. 402).

Meunier, 1906. Monographie des Tipulidae de l'ambre de la Baltique. Ann. Sci. Nat. (Zool.), Ser. 9, Vol. 4, pp. 349–401.

ABBREVIATIONS.

A	Anal vein.
a	Arculus in wing veins.
a	Anepisternal suture in thorax.
aed	Aedeagus.
aei	Anepisternal incision or cleft.
aem	Anepimerum or pteropleurum.
aes	Anepisternum.

alc	Precervicale.
ant	Antenna.
ap	Apical or outer process.
apn	Antepronotum.
b	Anepimeral suture.
bc	Basicercus (paraproct?).
blb	Basilabella.
bs	Basisternum of prothorax.
bst	Basistyle.
bta	Basitarsus ("metatarsus").
c	Pleural suture.
cg	Precercus.
cnj	Conjunctiva.
Cu	Cubitus.
cx	Coxa.
dc	Disticercus.
ds	Dististyle.
dta	Distitarsus.
ec	Eucoxa.
em	Epimerum.
epa	Epandrium (9th tergite of male).
es	Episternum.
fc	Frontoclypeus.
fe	Femur.
gap	Gonapophysis.
ge	Gena.
gu	Gula.
h	Humeral cross-vein.
iap	Intermediate process.
lc	Laterocervicale.
lbl	Labellum.
lr	Labrum or labrum-epipharynx.
M	Media.
m	Median (intermedian) cross-vein.
m-cu	Medio-cubital cross-vein.
mg	Mediogynium.
mn	Mentum.
mpl	Meropleurum.
mt	Mediotergite.
mtn	Metanotum.
mxp	Maxillary palpus.
nm	Notomacula.
oc	Occiput.
p	Prehaltere.
pa	Parietal region or vertex of head.
pa	Preanal vein of wing (Cu_2 according to Tillyard, 1st A of Comstock).
pas	Parascutellum or axilla.
pat	Paratergite.
pd	Pedicel.
pg	Proctiger.
pgr	Palpiger.
ppd	Postpedicel.
ppn	Postpronotum.
ps	Presternum of prothorax.
psc	Prescutum.
psl	Postscutellum.
pt	Postalare or Pleurotergite.
R	Radius.
R_s	Radial sector.
r-m	Radio-medial cross-vein.
s	Scutal suture.
saf	Subalifer.
sal	Subalare.
sap	Basal process of dististyle.
Sc	Subcosta.
sc	Scutum.
sca	Scape.
sl	Scutellum.
sm	Submentum.
sp	Spiracle (metathoracic).
spl	Sternopleurum.
ta	Tarsus.
ti	Tibia.
tr	Trochanter.
tsp	Tibial spurs.
un	Claws or ungues.
vv	Hypogynial valves.

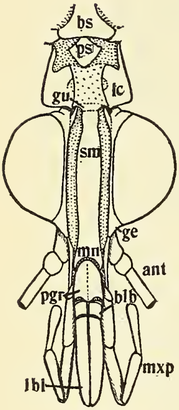

bs
ps
gu
fc
sm
ge
mn
ant
pgr
blb
mxp
lbl

Fig. 1

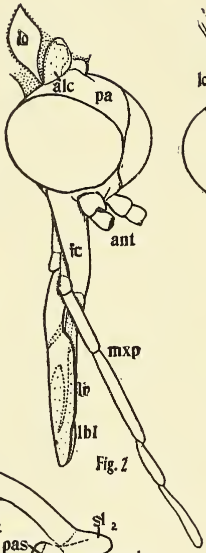

lo
alc
pa
fc
ant
mxp
lr
lbl

Fig. 2

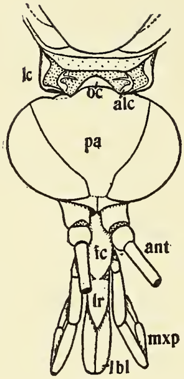

lc
oc
alc
pa
fc
ant
lr
mxp
lbl

Fig. 3

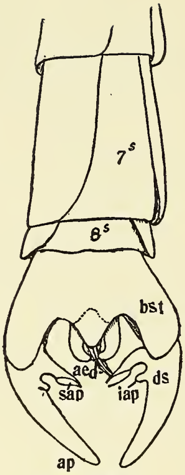

7^s
8^s
bst
aed
ds
sap
iap
ap

Fig. 4

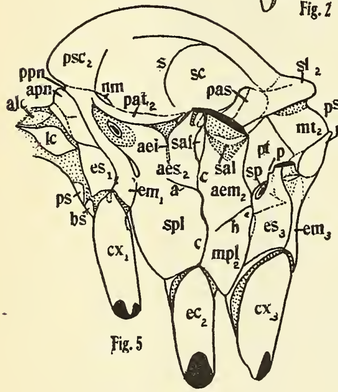

psc_2
ppn
apn
alc
s
nm
pat_2
sc
pas
sl_2
psl_2
mt_2
mtn_3
lc
aei
sal
es_1
aes_2
c
sal
pt
p
sp
ps
em_1
a
aem_2
bs
spl
h
es_3
em_3
cx_1
c
mpl_2
cx_2
cx_3

Fig. 5

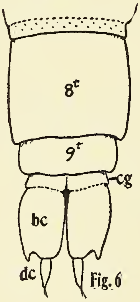

8^t
9^t
cg
bc
dc

Fig. 6

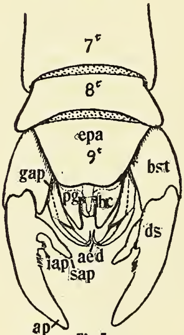

7^t
8^t
epa
9^t
gap
bst
pg
bc
ds
iap
aed
sap
ap

Fig. 7

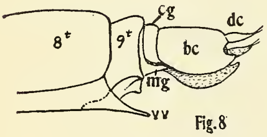

8^t
9^t
cg
dc
bc
mg
vv

Fig. 8

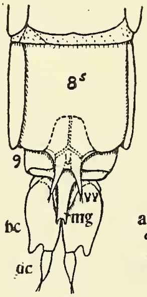

8^s
9
vv
mg
bc
dc

Fig. 9

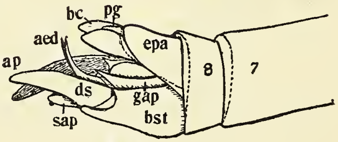

bc
pg
aed
epa
ap
8
7
ds
gap
sap
bst

Fig. 10

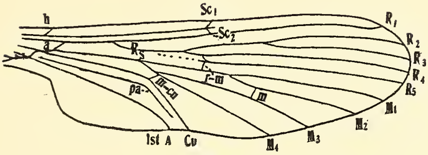

h
Sc_1
Sc_2
R_1
R_2
R_3
R_4
R_5
a
R_S
r-m
m
m-cu
pa
M_1
M_2
M_3
M_4
1st A
Cu

Fig. 11

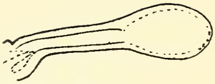


Fig. 12

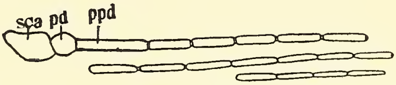


Fig. 13

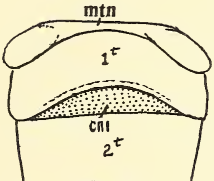

mtn
1^t
cnl
2^t

Fig. 15

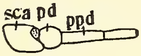


Fig. 14

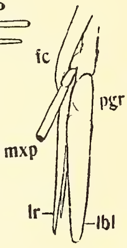

fc
pgr
mxp
lr
lbl

Fig 17

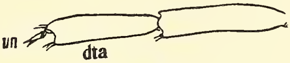


Fig. 16

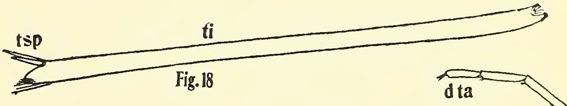


Fig. 18

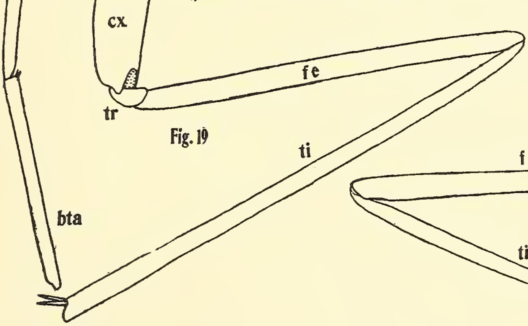

dta
cx
fe
tr
ti
bta

Fig. 19

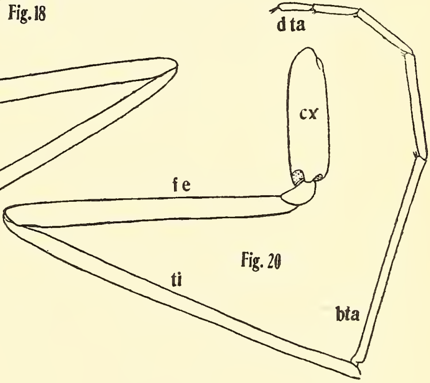

dta
cx
fe
ti
bta

Fig. 20

Explanation of Plates.

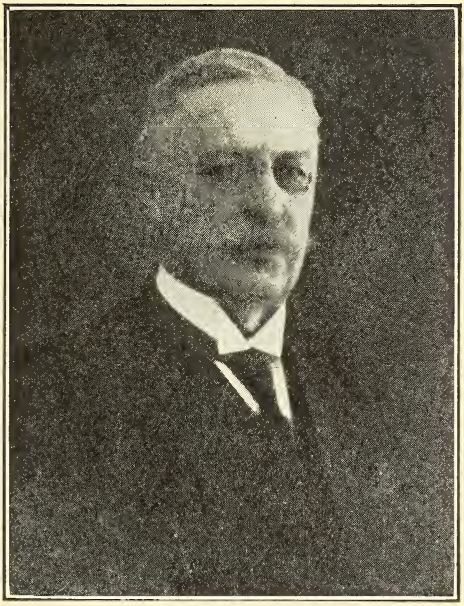
Fig. 1. Ventral view of head of female (slightly tilted upward).
Fig. 2. Lateral view of head of male viewed somewhat obliquely.
Fig. 3. Dorsal view of head of female (tilted downward).
Fig. 4. Ventral view of terminal abdominal structures of male.
Fig. 5. Lateral view of thorax.
Fig. 6. Dorsal view of terminal abdominal structures of female.
Fig. 7. Dorsal view of terminal abdominal structures of male.
Fig. 8. Lateral view of terminal abdominal structures of female.
Fig. 9. Ventral view of terminal abdominal structures of female.
Fig. 10. Lateral view of terminal abdominal structures of male.
Fig. 11. Dorsal view of right wing.
Fig. 12. Dorsal view of right halter.
Fig. 13. Ventral view of right antenna of female.
Fig. 14. Basal segments of male antenna viewed obliquely dorsally.
Fig. 15. Dorsal view of metanotum and first tergite.
Fig. 16. Lateral view of tip of left tarsus of male.
Fig. 17. Lateral view of terminal portion of trophi of male.
Fig. 18. Lateral view of right hind tibia of male.
Fig. 19. Lateral view of hind leg.
Fig. 20. Lateral view of left fore leg of male.

N. B.—The subscripts 1, 2, and 3 indicate that the part in question belongs to the pro-, meso-, or meta-thorax. The letter *t* written to the right and above a numeral indicates the tergite of the segment indicated by the numeral. The letter *s* indicates the corresponding sternite.

A Correction.—In his paper "Studies of North American Aegeriidae, No. 3," Bulletin, vol. XX, no. 4, p. 157, the author omitted to state the locality for the Holotype of *Alcathoe pepsioides.* It is Durango, Colo. The spelling of the specific name of the food-plant, "*Clematis ligustrifolia,*" also should be corrected to read "*ligusticifolia.*" Dr. T. D. A. Cockerell has been good enough to call attention to this omission and error.—Geo. P. Engelhardt, Brooklyn Museum.

ERNST EVALD BERGROTH: MASTER HEMIPTERIST (1857–1925).

By H. M. Parshley, Smith College.



ERNEST EVALD BERGROTH.

By the death of Dr. E. Bergroth in November last Hemipterology lost one of its most able and stimulating masters; and Entomology lost one of its few remaining amateurs of high attainments and broad general culture. The advance of science seems to require increasing specialization and professionalism, but surely we must all see with regret the passing, one by one, of those admirable figures who found opportunity—within a single life-time—not only to become educated in a real sense and to practise an exacting profession, but also to contribute essentially and generously to the growth of entomological science. It is doubtful whether we shall see their like again.

Bergroth studied physics, mathematics, natural science, and medicine at Helsingfors, Stockholm, and Berlin, and became a medical practitioner of notable ability. Most of his life was spent in official practice in Finland, but from 1906 to 1911 he lived in the United States, carrying on his professional activities in Duluth and Fitchburg. He knew periods of economic difficulty and wartime suffering, but from his university days until the time of his death he gave incessantly of his leisure and his energy to his entomological pursuits.

At first his studies touched upon a wide diversity of zoological groups, but his interests soon were concentrated upon the Tipulidae and the Hemiptera, on which he came to be universally recognized as a high authority. It is estimated that his published papers, chiefly on the taxonomy and bibliography of the Hemiptera-Heteroptera, exceeded 300 in number, and together they constitute an indispensable element in the equipment of all students of the order in every part of the world. Bergroth wrote few extensive articles and very seldom attempted comprehensive monographic treatments—chiefly because he lacked continuous spare time, had no very large collection, and lived for the most part away from the great libraries; but he chose his subjects well and rarely failed to make some definite and essential contribution, whether he wrote descriptions, synonymy, discriminative synopses, or criticism.

It is indeed in this last field, that of fiery and often magnificently destructive criticism, that Bergroth did some of his most important work. The sanative influence he exerted and will continue to exert upon beginning students—through his attacks on ignorant and careless workers, and his lively appreciation of thorough and honest effort—will prove to be not the least valuable element in his enduring contribution. No student can afford to neglect the study of Bergroth's masterpieces in the art of controversy; for when mutual criticism fails, science loses one of its most essential means of progress.

Bergroth published ninety papers bearing on the North American Heteroptera (listed in my recent Bibliography), but he was equally assiduous in the study of other faunas; and so it is to be hoped that his associates in Finland will prepare a complete record of his life-work, comparable with Palmén's survey of Reuter's activities. Such a record will not only have a lasting scientific value, but it will serve cultural ends as well. Who can fail to be impressed with the deficiencies of our educational system when its products are compared with Reuter and Bergroth? These men were typical European *savants,* representing in linguistic ability, in devotion to science and art, and in personal appearance the highest development of a culture which seems to be passing and which, at least in America, has become almost fabulous. That they were in a real sense citizens of the world can only enhance the pride which Finland must feel in claiming their allegiance.

ABOUT SOME NEWCOMERS.

Bulaea lichatschovi Hummel. Since first report of single specimens of this coccinelid at Rutherford, Nov. 10, 1922, in crevice of *Quercus ruber* bark and again at West Orange, Dec. 19, under bark of *Pinus strobus,* recorded in the minutes of the N. Y. Entomological Society, I have found several in December, 1924, at Teaneck, and, in numbers, at Paterson, during February, in both cases on trunks of *Acer saccharinum.* While there seems little doubt the species has established itself in New Jersey, search for it and its larvae particularly, during the summer months, has been unsuccessful. Since Chas. Schaeffer's original determination he apprised me that it is not the typical form but one of several, and distinguished in European catalogues as the variety *pallida.* Hab.: south Spain, Caucasus and Persia. Someone has said "not all the live stock brought into America from Europe, biped or hexapod, has turned out well." It is to be hoped this species partakes of the scale and aphis-feeding habits of most of its congeners, and does not have nor develop plant-destroying proclivities of *Epilachna borealis.*

Aphodius subterraneus Linn. With seeming interest and enjoyment a colony of this European species were disporting themselves in and about a small brown heap of excremental matter at Rutherford, N. J., August 10, 1925. The location borders on a nursery establishment. The scarabaeid appears to have been hitherto unrecorded from the United States. Its survival here will probably depend upon an undiminished supply of the food plantings. Seven specimens were taken; the series showing a range of elytral color from dark brown to black.

Doru aculeatum Scudder. On Nov. 15, 1925, twelve of this yellow-striped earwig were taken from the inside of a rotted stump of *Betula populifolia* at Hewlett, Long Island, N. Y., in low-lying damp woods near a stream. William T. Davis verified the identification and stated it is a new record for the Island.

F. M. Schott,
Brooklyn, N. Y.

DESCRIPTIONS OF SEVEN NEW SPECIES OF PILOPHORUS (Hemiptera, Miridae).[1]

By Harry H. Knight, Ames, Iowa.

Pilophorus nasicus n. sp.

General coloration and the silvery bands of the hemelytra suggestive of *hendemanni* Popp., but distinguished at once by the conically produced anterior half of head; eyes large, concave behind and set so they cover the anterior angles of pronotum.

> ♂. Length 2.9 mm., width 1.2 mm. Head: width .81 mm., vertex .31 mm.; overlapping strongly on pronotum, eyes completely covering anterior angles of pronotum. Rostrum, apparently reaching upon middle coxae (imbedded in glue). Antennae: segment I, length .19 mm., thickness .10 mm., dark reddish brown to blackish, yellowish brown on basal one-third, finely yellowish pubescent; III, .34 mm., slender, brownish black, pale at base; IV, .28 mm., blackish, narrowly pale at base. Pronotum: length .48 mm., width at base .97 mm.; lateral margins of disk moderately concave, basal angles sharply rounded. Scutellum rather strongly convex, nearly as in *buenoi* Popp., with tufts of silvery scales on basal angles and apex. Hemelytra with embolar margins only very slightly sulcate, nearly parallel; clothed with very fine, golden to dusky soft pubescence; color yellow brown, apical area of corium and embolium dark fusco-brownish, shining; cuneus uniformly dark fusco-brownish, a tuft of silvery scales on inner basal angle; corium and embolium bearing two interrupted transverse silvery bands, first band one-third of the way back from base of corium, a disconnected tuft set slightly nearer base of embolium, posterior band set slightly behind middle of corium, composed of four silvery tufts, one on embolium, two on corium, and one on clavus set slightly out of line distad, all the silvery scale-like tufts set on dark brown spots. Membrane and veins uniformly fusco-brownish. Epimeron of the mesothorax bearing two tufts of silvery scale-like pubescence, a third tuft on meta-episternum above ostiolar peritreme. Legs yellowish brown, anterior coxae pale in front; tarsi pale, apical segment fuscous. Venter dark brown, shining, two basal segments more or less pale.

---

[1] Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

Holotype: ♂, Nov., 1911, Newberry, Florida (Wm. T. Davis); author's collection.

Pilophorus strobicola n. sp.

† *Pilophorus crassipes* Knight, Hemiptera, Conn., 1923, p. 542.

Pilophorus crassipes Poppius was described from Colorado specimens and is a different species from the one that breeds on white pine (*Pinus strobus*) in the eastern states, and that I redescribed (1923) as *crassipes* Popp. In the original description of *crassipes* Poppius, the first specimen mentioned is from Manitou, Colorado, and judging by the description of the pubescence on the hemelytra this specimen must be regarded as the type from which the description was drawn. The specimens listed from New Jersey and Washington, D. C., belong to a different species, *vanduzeei* Knight, as I have found after examining type material from all the localities mentioned. I have specimens of *crassipes* Poppius from Manitou and Salida, Colorado, and collected it at Trinidad and Ft. Garland, Colorado, and Grand Canyon, Arizona. *Vanduzeei* Kngt. and *uhleri* Kngt. are distinguished from *crassipes* Popp. and *strobicola* n. sp. by the erect, short, black bristles which beset the hemelytra, while the latter two species are clothed only with fine, recumbent, soft pubescence. *Strobicola* is distinguished from *crassipes* Popp. by the more slender and pale antennal segment III and the more sharply clavate segment II.

Holotype: ♂, June 30, 1920, Ithaca, New York (H. H. Knight); author's collection. *Allotype:* same date as the type. *Paratypes:* 24 ♂ ♀, taken with the types on *Pinus strobus.* New York—4 ♂ ♀, July 26, 1916, Ithaca; 18 ♂ ♀, July 13, 1920, Ringwood near Ithaca; 16 ♂ ♀, Sept. 1, 1918, Madison Barracks; 25 ♂ ♀, Aug. 22, 1916, Whiteface Mt. (H. H. Knight). 3 ♂ ♀, Aug. 1–8, 1917, Cranberry Lake (C. J. Drake). 3 ♂ ♀, July 4, 1924, White Plains (J. R. de la Torre-Bueno). Minnesota—10 ♂ ♀, Aug. 18, 1920, Elkhorn Creek, Carlton County (H. H. Knight).

Pilophorus piceicola n. sp.

Suggestive of *strobicola* but distinguished at once by the recumbent black pubescent hairs on the hemelytra and the shorter and more strongly incrassated antennal segment II.

♂. Length 4.2 mm., width 1.5 mm. Head: width 1.06 mm., vertex .51 mm. Rostrum: length 1.7 mm., barely attaining posterior margins of hind coxae (missing in type). Antennae: segment I, length .31 mm., fusco-brownish; II, 1.52 mm., gradually thickened from base toward apex, thickness .17 mm. on apical half, rather thickly clothed with black pubescent hairs; III, .53 mm., pale, slender (.057 mm. thick), white, narrowly darkened at tip; IV, .54 mm., pale, fuscous on apical one-third. Pronotum: length .80 mm., width at base 1.28 mm.

Coloration suggestive of *strobicola* but hemelytra yellowish brown except behind the posterior silvery line, being clothed with recumbent, black pubescent hairs and sparsely intermixed with a few golden scale-like hairs; posterior silvery line transverse as in *strobicola*, but more thickly set with silvery scale-like hairs; also the apical area somewhat more strongly shining.

♀. Length 3.8 mm., width 1.5 mm. Head: width 1.09 mm., vertex .57 mm. Antennae: segment I, length .32 mm.; II, 1.58 mm., thickness of clavate portion .17 mm.; III, .60 mm.; IV, broken; coloration as in the male. Pronotum: length .74 mm., width at base 1.20 mm. Very similar to the male in form, pubescence, and colorotion.

Holotype: ♂, July 5, 1924, Hartsdale, New York (J. R. de la Torre-Bueno); author's collection. *Allotype:* ♀, July 31, 1920, Cold Spring Harbor, New York (J. R. de la Torre-Bueno). *Paratypes:* 2 ♂ taken with the type on *Picea excelsa.* ♀, July 25, 1922, White Plains, New York (J. R. de la Torre-Bueno).

Pilophorus walshii Uhler, Ent. Amer., iii, p. 30, 1887.

This species is best distinguished from allied forms by the short rostrum which scarcely reaches posterior margin of mesosternum. For purposes of comparison with other species described I am giving some accurate measurements of *walshii* Uhler.

♂. Length 3.3 mm., width 1.22 mm. Head: width .83 mm., vertex .42 mm. Rostrum, length .97 mm., scarcely attaining hind margin of mesosternum. Antennae: segment I, length .23 mm.; II, .98 mm.; III, .34 mm.; IV, .32 mm. Pronotum: length .66 mm., width at base 1.06 mm.

I have found this species breeding only on honey locust (*Gleditsia triacanthos* L.) to which plant it seems to be restricted in its breeding habits. I have collected it at Ames, Iowa, July 2 to September 28, 1925, and Springfield, Missouri, July 18, 1915, always on honey locust. Specimens are at hand from Urbana, Illinois, September 8, 1916, also collected on honey locust. The type locality of the species is Rock Island, Illinois, where it was collected by B. D. Walsh.

Professor B. B. Fulton published an article (Ann. Ent. Soc. Am., XI, 1918, pp. 93–96) on the habits of a species which he called *walshii* Uhler, on the authority of a determination by Heidemann. After an examination of his original drawings, as well as judging by the habits of the species which I have also collected on apple and Crataegus, we are able to place the species he worked with as *Pilophorus perplexus* D. & S. I have seen specimens of *walshii* Uhler only from the states herewith mentioned, yet its range may well extend into those states where the honey locust thrives in its native habitat.

Pilophorus australis n. sp.

This species runs to *walshii* Uhler in my key to the species of Pilophorus (Hemip. Conn., 1923, p. 538) but is distinguished by the longer rostrum which attains posterior margins of intermediate coxae, and in general by the somewhat larger size and reddish brown coloration; from *brunneus* Popp. it is distinguished by the shorter antennal segment II which is not equal to the distance from tip of tylus to basal margin of pronotum, and likewise by the more reddish brown coloration.

> ♂. Length 3.4 mm., width 1.28 mm. Head: width .88 mm., vertex .39 mm.; a little more sharply produced and the eyes more prominent than in *walshii* Uhler. Rostrum: length 1.37 mm., reaching posterior margins of intermediate coxae. Antennae: segment I, length .26 mm.; II, 1.14 mm., reddish brown, fuscous apically; III, .56 mm., fuscous, basal one-third pale; IV, .48 mm., fuscous. Pronotum: length .63 mm., width at base 1.06 mm., width at anterior angles .64 mm.; appearing more narrow than *walshii* when compared with width of head. General coloration more of a red brown than in *walshii*, with apex of clavus darker and more shining, although the silvery bands and scutellum are very similar.
>
> ♀. Length 3.6 mm., width 1.28 mm. Head: width .88 mm., vertex .43 mm. Rostrum: length 1.5 mm., attaining posterior margins of intermediate coxae or to middle of hind coxae. Antennae: segment I, length .28 mm.; II, 1.23 mm.; III, broken. Pronotum: length .63 mm., width at base 1.06 mm. Very similar to the male in form and coloration.

Holotype: ♂, June 17, 1917, Donaldsonville, Louisiana (H. H. Knight); author's collection. *Allotype:* same data as type. *Paratypes:* 4 ♂, taken with the types; in Cornell University collection and Iowa State College collection. My notes show that this species was collected only on *Salix*.

Pilophorus geminus n. sp.

This species runs in the section with *perplexus* D. & S. and *walshii* Uhler in my key to the species of Pilophorus (Hemip. Conn., 1923, p. 538), but differs from both in having the posterior silvery band widely dislocated at the radial vein, the inner portion set forward and forming a transverse line with that on clavus.

♂. Length 3.2 mm., width 1.08 mm. Head: width .88 mm., vertex .45 mm. Rostrum: length 1.26 mm., reaching to middle of posterior coxae, brownish, apex blackish. Antennae: segment I, length .23 mm., thickness .085 mm., yellowish to dusky; II, .93 mm., nearly cylindrical, thickness .057 mm., yellowish brown, apical one-third fuscous; III, .40 mm., blackish, pale at base; IV, .38 mm., blackish. Pronotum: length .52 mm., width at base .97 mm.; disk moderately convex, slightly depressed between calli, basal margin of disk broadly sulcate on middle then rounding slightly forward to basal angles. Distance between tip of tylus and base of pronotum 1.06 mm. Head and thorax brownish black, juga and lora more yellowish; clothed with fine, recumbent, fuscous pubescence and intermixed with finer yellowish pubescence, surface scarcely shining. Scutellum nearly as in *walshii* but with fuscous pubescence on disk, the flat apical field set with silvery scale-like hairs as well as the basal angles. Sternum dark brownish, polished; ostiolar peritreme yellowish brown.

Hemelytra light cinnamon yellow, clothed with recumbent fuscous pubescence; base and apex of clavus, outer half of corium and embolium behind the outer piece of posterior silvery band, and the cuneus, dull blackish, scarcely shining when viewed in certain lights; inner basal angle of cuneus and point at apical margin of corium, set with silvery scale-like hairs; basal bands of corium set before middle and directed somewhat obliquely distad; posterior silvery band of corium widely disconnected at radial vein, the inner portion set cephalad and forming a transverse line with silvery scales on clavus. Membrane fuscous, veins and areoles tinged with yellowish. Legs yellowish brown, hind tibiae becoming fuscous, apical segment of tarsi black; coxae pale, fuscous on basal half, apex of front pair yellowish brown, trochanters pale except those of front legs; clothed only with soft fine pubescence.

Holotype: ♂, Aug. 7, 1924, St. Anthony Park, St. Paul, Minnesota (H. H. Knight), collected at light; author's collection.

Paratypes: 2 ♂, June 20, 1921, New Ulm, Minnesota (H. H. Knight); Minnesota University collection. ♀ (teneral), June 11, 1910, Wonewac, Wisconsin (J. G. Sanders).

Pilophorus fuscipennis n. sp.

In the key of Poppius (Ann. Soc. Ent. Belg., *58* (1914) p. 237) to the species of *Pilophorus,* this form runs to *exiguus* Popp. but is easily distinguished by the fuscous hemelytra which are scarcely tinged with brownish, and the somewhat differently formed posterior silvery band; also distinguished by the longer and more sharply produced head.

♂. Length 3.4 mm., width 1.14 mm. Head: width .88 mm., vertex .43 mm.; from tip of tylus to base of vertex .86 mm. Rostrum: length 1.51 mm., reaching to middle of posterior coxae, fusco-brownish, blackish on apical half. Antennae: segment I, length .23 mm., pale fuscous; II, 1 mm., slender, slightly thicker on apical half but scarcely exceeding thickness of segment I, fuscous, darker on apical half; III, .43 mm., blackish, pale at base; IV, .41 mm., black, narrowly pale at base. Pronotum: length .57 mm., width at base .91 mm.; lateral margins strongly sulcate, surface of disk dull, opaque, basal half finely alutaceous; distance from tip of tylus to base of pronotum 1.31 mm. Head and thorax fuscous to black, lower half of face more brownish; clothed with very fine recumbent, yellowish pubescence. Scutellum nearly as in *exiguus* although black in color, with tufts of silvery scales on basal angles and on apex. Sternum dark brownish black, polished.

Hemeltyra fuscous although frequently tinged with brownish, clothed with very fine simple, recumbent, fuscous pubescence; basal silvery band nearly as in *exiguus,* posterior band partially interrupted at radial vein, and from inner field of clavus it turns very slightly, obliquely distad, continuing the same direction across clavus to the commissure; the usual shining areas on apex of clavus, the cuneus, and outer half of corium behind the posterior silvery line, are here rather dull or with wax-like sheen; apical margin of corium with about six small points of silvery scales; membrane pale fuscous, but with central area distinctly darker. Legs dark fuscous to black, tibiae more yellowish brown except hind pair, the trochanters and apical half of coxae pale except on front legs, the fore coxae white with only base and apex somewhat darkened. Venter black, moderately shining, with the usual oblique band of silvery scales on sides.

♀. Length 3.3 mm., width 1.24 mm. Head: width .93 mm., vertex .48 mm. Antennae: segment I, length .23 mm.; II, 1.03 mm.; III, .46 mm.; IV, .43 mm. Slightly more robust than the male but very similar in coloration and pubescence.

Holotype: ♂, Aug. 7, 1925, Stonewall, alt. 8,500 ft., near Trinidad, Colorado (H. H. Knight); author's collection. *Allotype:* same data as type. *Paratypes:* 12 ♂ ♀, taken with types on the limber pine (*Pinus edulis*). ♂ ♀, Aug. 10, 1925, Ft. Garland, Colorado (H. H. Knight), taken on *Pinus edulis.* ♂ ♀, Aug. 3, 1917, Grand View, Grand Canyon, Arizona (H. H. Knight). Paratypes in collections of Iowa State College and Colorado Agricultural College.

Pilophorus opacus n. sp.

In the key of Poppius (1914) to the species of *Pilophorus* this form runs to *walshii* Uhler, but it is very different in several respects; in general aspect more nearly that of *clavatus* Linn. but the rostrum and antennal segment II shorter, the dorsal surface darker and more opaque.

♂. Length 4.2 mm., width 1.54 mm. Head: width 1.08 mm., vertex .60 mm.; black, the juga and margins of tylus and lora brownish. Rostrum: length 1.54 mm., just attaining posterior margins of intermediate coxae, piceous. Antennae: segment I, length .28 mm., fusco-brownish, paler beneath; II, 1.38 mm., gradually enlarged toward apex to a thickness of .10 mm., black, reddish brown on basal half; III, .57 mm., rather slender, pale and tinged with reddish, apical half blackish; IV, .46 mm., blackish, pale at base. Pronotum: length .74 mm., width at base 1.28 mm.; black, scarcely shining; distance between tip of tylus and base of disk 1.56 mm. Scutellum nearly as in *clavatus.* Dorsum clothed with simple, recumbent, golden yellow pubescence, the margins of pronotum, scutellum, and the hemelytra sparsely set with erect, stiff, brownish hairs. Clavus black, opaque, with velvety sheen, slender sutural margin and the corium dark chocolate brown, the inner apical field of clavus nearly black, although apical margin paler; posterior silvery band transverse on corium, but dislocated at the claval suture, the band on clavus disconnected and set forward for a space equal to thickness of band. The usual shining areas are here frosted over with a wax-like sheen. Membrane fusco-brownish, slightly darker on central area. Legs black, apical one-third of tibiae more brownish; coxae deep black, apices pale, trochanters pale except on fore legs, fore coxae with paler area across middle. Venter black, moderately shining.

♀. Length 3.7 mm., width 1.4 mm. Head: width 1.11 mm., vertex .63 mm. Antennae: segment I, length .28 mm.; II, 1.31 mm.; III, .48 mm.; IV, .40 mm. Pronotum: length .74 mm., width at base 1.17 mm. Very similar to the male in coloration and pubescence.

Holotype: ♂, Aug. 17, 1925, Gunnison, Colorado (H. H. Knight); author's collection. *Allotype:* same data as the type. *Paratypes:* 3 ♂, taken with the types on *Chrysothamnus,* the largest member of the genus growing in that locality. 4 ♂ 2 ♀, Aug. 15, 1925, Dolores, Colorado (H. H. Knight), on *Chrysothamnus.* ♂, July 31, 1900, Ridgway; ♀, Aug. 2–3, 1900, Dolores, Colorado (E. D. Ball). Paratypes in collections of Iowa State College and Colorado Agricultural College.

Alepidia gracilis (Uhler).

This species was originally described as a *Pilophorus,* but Reuter (1909) made it the type of a new genus, *Alepidia.* Uhler (1895) described *gracilis* as having the hemeltyra " not banded." The genus *Alepidia* was described as differing from *Pilophorus* largely in having the hemelytra destitute of silvery, scale-like bands. I have collected specimens in New York and Alabama which bear silvery scale-like patches on the hemelytra which suggest the scale-like bands found in the genus *Pilophorus.* More recently I have received from Mr. W. S. Blatchley a specimen from Florida and one from Indiana which bear the same scale-like pubescence on the hemelytra. The question now arises whether or not *gracilis* Uhler described from Colorado will not prove to have the silvery scale-like patches on the hemelytra when fresh material is carefully collected. The scale-like pubescence found on many species of Mirids is very delicate and requires careful handling to preserve specimens in perfect condition, yet the character of the pubescence furnishes some of the most distinctive characters for separating closely related species.

Since considerable time may elapse before new and perfect specimens of *gracilis* Uhler are collected from the type locality for settling the question of pubescent characters, I take this occasion to propose a varietal name for the eastern form which bears scale-like pubescence. If it is found that perfect specimens of *gracilis* Uhler do not bear scale-like pubescence, which is according to the original description of the species and the founding of the genus *Alepidia* Reuter, then the variety herewith described would probably prove to be a good species. If *gracilis* Uhler and *Alepidia* Reuter were founded on imperfect specimens then the present varietal name would fall into synonymy.

Alepidia gracilis var. **squamosa** new variety.

> Having the same body form as *gracilis* Uhler, but the hemelytra bearing patches of silvery, scale-like pubescence; one such patch near base of corium and two such patches near middle of corium forming a dislocated band, the inner portion connected posteriorly with a scale-like patch on clavus near apex.

Type: ♀, June 9, 1917, Tuskegee, Alabama (H. H. Knight); author's collection. *Paratypes:* ♂ 3 ♀, taken with the type on *Pinus glabra.* 2 ♀, June 11, 1917, Thomasville, Alabama (H. H. Knight). ♂ 3 ♀, July 11, 1920, Taghanic, New York (H. H. Knight), found breeding on *Pinus resinosa.* ♀, Feb. 16, 1913, Kissine, Florida (W. S. Blatchley). ♂, June 14, 1909, Lake County, Indiana (W. S. Blatchley).

While the present form is described with silvery, scale-like bands on the hemelytra as is true of species in the genus *Pilophorus,* the genus *Alepidia* may still be separated by the broad head and parallel-sided hemelytra.

Three Rare Butterflies from Long Island, New York.—The following butterflies, uncommon on Long Island, N. Y., were taken by the writer at Flushing, during the summer of 1925, and have been placed in the collection of the Brooklyn Museum.

Zerene caesonia Stoll.

A somewhat worn female was taken on July 12, the only other record for this species on Long Island, known to the writer, is that of Mr. Jacob Doll, for Prospect Park, Brooklyn.

Eurymus eurytheme form *aest. amphidusa* Boisduval.

A male, in fairly good condition, taken on August 1; there are a few other records for *eurytheme* on Long Island. This specimen and the one following were kindly identified for me by Mr. F. E. Watson, of the American Museum of Natural History.

Eurymus philodice ab. *rothkei* Reiff.

A male in fair condition taken on July 4, appears to be the only Long Island record for this aberration, which was described by Reiff in The Lepidopterist, Vol. I, No. 2, page 84, August 15, 1917, and figured on Plate 7; the specimen taken by the writer appears to be somewhat more heavily suffused with black scales, than shown in the above-mentioned plate, but otherwise agrees very well with the description.—E. L. Bell, Flushing, N. Y.

PERIODICAL SWARMING OF CELERIO LINEATA IN ECUADOR.

By George P. Engelhardt, Brooklyn Museum, Brooklyn, N. Y.

Dr. R. C. Murphy, of the American Museum of Natural History, early this spring brought back from Point Santa Elena, Ecuador, a good series of the hawkmoth *Celerio lineata,* of which he reports countless numbers attracted to lights at night. He also learned that the swarming of this moth recurs at regular intervals, but only coincident with the wet years in Ecuador, usually every seventh year, but in this case in the sixth year. Inhabitants of the region believe the insect to be non-existent during the long succession of dry years and its sudden appearance in such great abundance with the advent of a wet year has impressed them as something very mysterious.

Two theories suggest themselves as most likely in explaining this phenomenon. The first is that of estivation. There are records from arid countries citing pupal periods covering three and four years. For example, *Agapema galbina* from Brownsville, Texas, of which a cocoon cluster comprising several hundred was obtained by the Brooklyn Museum, produced moths every year, but in diminishing numbers until the fourth year. From the extremely dry parts of the West coast of South America it would not be surprising to learn of still more prolonged periods of estivation.

The second theory is that of migration. *Celerio lineata* is one of the most widely distributed species of all hawkmoths. It ranges through both South and North America from Cape Horn to subarctic regions and is said to occur also in Europe. It is considered the commonest of all North American Sphingidae and appears to be equally well at home on alpine meadows above timber-line and in flower fields near sea-level, with this difference, however, that in cold climes it is active during sunshine while in warm climes it prefers the hour after sunset and before sunrise. Swarms of the moths have been reported from steamers several hundred miles out at sea.

In temperate zones the insect is two-brooded; in tropical and sub-tropical climates breeding is continuous, excepting in dry seasons. The large, vari-colored green and black larvae are quite plentiful in some years throughout the Eastern States, feeding on *Portulaca* and evening primrose in agricultural fields and gardens. In other years they are encountered rather sparingly due to the attacks of tachinid flies which prevent successive years of abundance. At the meeting of the Pacific Coast Division of the American Association for the Advancement of Science held at Salt Lake City during June, 1922, the writer witnessed what might be called a migration of the larvae. With nothing suitable for food left on the neighboring hillsides they had invaded the university grounds, doing the work of a lawnmower in reducing the grass to proper shortness. When disturbed they throw their heads violently from side to side, at the same time emitting nasty, green masses of regurgitated food.

Swarms of the moths and dead specimens in the wash-up are not unusual during midsummer along the beaches of Long Island and New Jersey. These indicate migrations from the South. Such flights undoubtedly also take place in South America. A swarm reaching Ecuador in a wet year with its correspondingly luxuriant vegetation should find there a most favorable abiding place. In the tropical climate the moths would multiply rapidly, thus accounting for the hordes observed by Dr. Murphy.

A Correction.—In the Bulletin of the Brooklyn Entomological Society, Vol. XX, No. 5, page 211, Metcalf and Bruner described a new genus of Membracidae under the name "*Brachycentrus*." This name, however, is already preoccupied by Brachycentrus, Curtis, 1834, a fact which we had overlooked until it was called to our attention by Dr. C. P. Alexander. We propose, therefore, the name "**Brachycentrotus**" for this genus.—Z. P. Metcalf, Raleigh, N. C.; S. C. Bruner, Havana, Cuba.

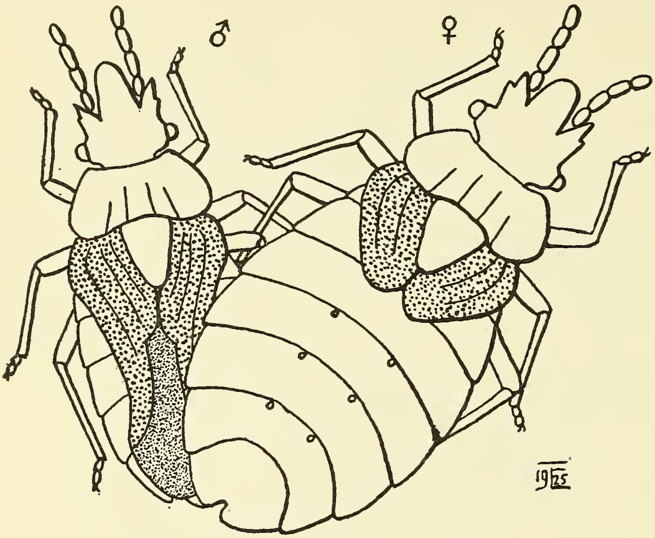
A BIOLOGICAL NOTE ON THE PTERYGOPOLYMORPHISM OF ARADUS.

(Hemiptera, Aradidae.)

By Teiso Esaki, Entomological Laboratory, Department of Agriculture, Kyushu Imperial University, Fukuoka, Japan.

It is a well-known phenomenon that among the species of *Aradus* frequently occurs the pterygopolymorphism. As already shown by Parshley (1921), there are two ways of the reduction of hemielytra in *Aradus, i.e.,* (1) by abbreviation of the hemielytra, or true brachyptery, and (2) by extreme attenuation without loss in length, or stenoptery. He gave a table of seven North American species of the genus, in which the pterygopolymorphism occurs, and pointed out an interesting fact " that stenoptery is found only in male individuals, while brachyptery is, with one exception, confined to females, suggesting that the phenomenon is connected with hereditary processes of a Mendelian nature." The brachyptery and aptery are also commonly met with among various families of Hemiptera-Heteroptera, and especially well distributed among the species of the Gerridae and Veliidae. Reuter (1875) and Kirkaldy (1899) supposed that the phenomenon was worked out by the course of natural selection. In either case, it is quite sure that the apterous or brachypterous form is a secondary form, but not primitive as supposed in the case of *Halobates* by B. White (1883), and in most cases, it is presumably an adaptation to the life-habits of the insects. For example, in the Gerridae, it may be an adaptation to the life on water, where the use of wings may be less important than in other habitats. Also an interesting fact discovered by Torre-Bueno (1908), that the macropterous water-striders of the *Halobates-Metrocoris* group of the Gerridae, in which most of the species are normally apterous and rarely macropterous, break off the apex of hemielytra with the legs of the insects themselves to facilitate the copulation, is highly suggestive that the aptery in this case may be an adaptation for this purpose. Fallén (1806) also supposed that the brachypterous form of a homopteron *"Delphax dispar"* Fallén [= *Liburnia pellucida* (Fabricius)] is of an adaptive significance for the same purpose.

In the case of *Aradus,* the brachyptery may be an adaptation to the life under bark of trees, as it is well-developed in the spe-



cies inhabiting such places, as *Aradus cinnamomeus* Panzer, and, in fact, I have never seen a brachyterous specimen of the species which is known to inhabit fungi.

On the other hand, however, the stenoptery, which is known only among the males of some species, seems, according to the author's observation, to be of a quite different biological significance from that of the brachyptery. It may be connected with the curious habit of copulation of the insects.

It is already known, that the bugs of the genus *Aradus* copulate in a quite different way from any other Hemipteron, *i.e.,* the male puts himself on the left side of his mate and fits the copulatory organs, which are found on the dorsal surface of the genital segments, to hers from the underside of female. Thus, both the insects take a position like the letter " V." In this case, the male always turns his abdomen a little to the right from the axis of the body in order to fit the copulatory organs. I have observed many cases in seven species: *i.e., Aradus depressus* (Fabricius), *A. consentaneus* Horváth, *A. cinnamomeus* Panzer, *A. melas* Jakovlev, *A. corticalis* (Linné), *A. betulae* (Linné), and *A. lugubris* Fallén, but have never seen a case in which the male put himself on the right side of the female, and it may presumably depend on the asymmetry of the copulatory organs of the male, whose structures are at present almost unknown in details. Strawinski (1925) gave a photograph of a mating pair of *Aradus cinnamomeus* Panzer. It is quite clear that the stenoptery is much more adaptive for this habit of copulation than the macroptery, as recognizable in the figure, and in other cases, in which males have macropterous hemielytra, the wings of the male are put between the abdomen and wings of the female, or on the wings of the female and sometimes it is observable that the wings of both the individuals are getting caught to each other.

The occurrence of the pterygopolymorphism is, with a high degree of probability, connected with the hereditary process, as suggested by Parshley, but not with the physical conditions influencing development of the insects, as in the case in some *Gerris*-species as already reported by Poisson (1921).

LITERATURE REFERRED TO.

Fallen, C. F. Försök till Svenska Cicad-Arternas uppstållning och beskrifning, sec. 4. Kongl. Vetenskaps Academiens Nya Handlingar, 1806, pp. 113–130, 1806 (reference to pp. 128–129).

Kirkaldy, G. W. A Guide to the Study of British Water-bugs. Polymorphism. Entomologist, vol. 32, pp. 108–115, 1899.

Parshley, H. M. Essay on the American species of *Aradus*. Trans. Amer. Ent. Soc., vol. 47, pp. 1–106, 1921 (reference to pp. 4–5).

Poisson, R. Brachypterisme et apterisme dans le genre *Gerris*. Compt. Rend. Séan. Soc. Biol., tom. 175, pp. 947–950, 1921.

Reuter, O. M. Remarques sur le Polymorphisme des Hémiptères. Ann. Soc. Ent. France, tom. 5, pp. 225–236, 1875.

Strawinski, K. Historja naturalna korowca sosnowego *Aradus cinnamomeus* Panzer. Roczników Nauk Rolniczych i Lesnych, tom. 13, pp. 644–693, 1925.

Torre-Bueno, J. R. de la. The broken hemielytra in certain Halobatinae. Ohio Nat., vol. 9, pp. 389–392, 1908.

White, F. B. Report on the Pelagic Hemiptera procured during the voyage of H. M. S. *Challenger* in the years 1873–1876. Challenger Report, Zoology, vol. 7, pt. 19, 1883 (reference to p. 75).

THE MORPHOLOGICAL SIGNIFICANCE OF THE JUXTA IN THE MALE GENITALIA OF LEPIDOPTERA.

By John R. Eyer, Pennsylvania Bureau of Plant Industry.

In a previous publication[1] relating to the male genitalia of Lepidoptera I did not clearly explain the morphological significance of certain structures situated in the basal region of the valves (gonopophyses) and the penis. These structures, known as the " juxta " in Lepidoptera, form a triangular or quadrate plate on the ventral side of the genitalia just caudad of the ninth sternite. The bases of the valves and occasionally the base of the penis are articulated to the lateral or caudal margins of the juxta. Dr. G. C. Crampton has suggested that this plate is homologous with the " basal plate " of more primitive winged insects in which it is formed by the uniting of the basal segments (coxites) of the gonopophyses. He has further called my attention to the male genitalia of the Tenthredinoid Hymenoptera, which I omitted in my former discussion, which supply a type of genitalic structure intermediate between those of the Ephemerida on the one hand and the Mecoptera, Trichoptera, and Lepidoptera on the other and serve as a basis for determining the homology of the basal plate in these more specialized orders. Through the kindness of Dr. Crampton, Dr. J. C. Bradley, and Dr. J. McDunnough I have been able to examine a series of Ephemerid and Tenthredinid genitalia and compare them with those forms treated in my previous paper. The following is a brief summary of this comparison.

In certain Ephemerida, such as *Leptophlebia* (Fig. 1), the gonopophyses are composed of a pair of distinctly separate basal plates or coxites each bearing a three-segmented gonostyle. The penis is distinctly bipartate and is enclosed laterally by a pair of chitinized sheaths known as the penis valves. In other Ephemerida, *Blasturus* (Fig. 2), the coxites are completely fused forming a chitinous girdle and the gonostyli are composed of but two segments. The penis valves are less distinctly separated from the lateral walls of the penis.

In the generalized Tenthredinoidea as represented by *Megaxyela* (Fig. 3), the basal plate resembles that of *Blasturus* but is

---

[1] Annals, Ent. Soc. of America, XVII, 275–342, 1924.

smaller and forms a girdle around the bases of the two-segmented gonostyli. Both segments of the gonostyli are larger and heavier than those of the mayflies and the basal segment or basistylus is divided into an inner and outer surface by a fold which Freeborn[2] has termed the "interbasal fold." The penis valves are distinctly separate and the membranous penis is enclosed between them. Although the basal plate shows little evidence of being composed of two elements in adult Hymenoptera its origin from the separate basal portions of the gonopophyses is well described by Zander[3] in his work on the prepupal and pupal development in the genitalia of Vespa. He refers to the basal plate as the "cardo" and describes it as arising as a thickening of the ventral and lateral portion of the bases of the buds which later form the valves or gonopophyses. This occurs in the late larval and early pupal development just after the cocoon is spun and the larva has commenced pupating. From this time on the cardo appears as the basal portion of the valves and is not separated from them by a suture until quite late in the development of the pupa.

In most Mecoptera the condition of the basal plate is similiar to that in the Tenthredinoidea. It is much smaller however and is either fused with the bases of the basistyli as in the Meropidae (Fig. 4), or forms a narrow bridge connecting them as in the Boreidae (Fig. 5). In the Meropidae, Nannachoristidae, and Boreidae there is a small cup-like structure situated at the apex of the terminal segment, (dististylus), of the gonostylus. In my previous publication I called this a "sense organ" and it is possible that it represents the rudiment of the third segment of the gonostylus which exists in a less abbreviated form in many of the mayflies. The penis may consist of a simple chitinized tube as in the Boreidae or may be protected by a pair of valves as in the Meropidae and Panorpodae. These latter are often greatly modified and are fused with the basal plate and basistyli.

In the Trichoptera the basal plate and the gonopophyses offer a great variety of structure and furnish the intermediate forms between the types of structures just described for the Tenthredinoidea and Mecoptera and those of the primitive Lepidoptera. In the Rhyacophilidae and Philopotamidae, (Fig. 6), the basal plate forms a bridge which unites the bases of the gonostyli just as in the Boreidae. The gonopophyses are heavy, two jointed and have distinct inner and outer surfaces. In the Phryganeidae as illustrated by *Neuronia* (Fig. 8), the basal plate is large and unites the large bases of the gonopophyses much in the same manner as described for the Tenthredinoidea and the Meropidae and Panoridae. The gonopophyses are strikingly like those of the Mecoptera in appearance and structure. In the genus *Phryganea,* however, the basal plate is indistinguishably fused with the basistyli and the dististyli are small and inconspicuous. In the Molannidae (Fig. 7) the basal plate is large and quadrate and unites the bases of a pair of one-jointed gonopophyses. The tendency of the gonopophyses to be single jointed is characteristic of the more specialized Trichoptera. In all adult Trichoptera examined the penis consists of a simple membranous tube protected by a chitinized sheath which in the Lepidoptera is called the ædœagus. There is no evidence of its being bipartate in adult Trichoptera although in some Rhyacophilidae and Phryganeidae the terminal portion is bifid or divided into lobes or processes. More trustworthy evidence of the origin of the penis from two elements is to be found in the work of Zander[4] on the prepupal and pupal development of the genitalia in the Trichoptera and Lepidoptera. This phase of the subject has been exhaustively treated in my previous publication and needs no further discussion here.

---

[2] American Journal of Hygiene, IV, 188–212, 1924.

[3] Zeitsch. für Wiss. Zool. LXVII, 461, 1900.

The basal plate or juxta of the Lepidoptera is either similar to that described for the Rhyacophilidae and Philopotamidae or for the Phryganeidae and Molannidae. The first or Rhyacophiloid type is to be found in all families of the Micropterygoidea (Fig. 9), with the exception of the Mnesarchaeidae. The second or Molannoid type occurs in the most simple form in the Hepialidae (Fig. 10), and in a more modified condition in the Megalopygidae (Fig. 12). The types of juxta which occur in the more specialized micro-lepidoptera are essentially modifications of those just mentioned, *e.g.,* the Zygaenoidea (as defined by Forbes in "Lepidoptera of New York and Neighboring States," C. U. Ag. Exp. Sta., Mem. 68, 1923) (Fig. 15), are modifications of the Hepialid and Megalopygid types, the Tineoidea (Fig. 11), intermediate between the Hepialid and Micropterygid types, and the Tortricoidae (Fig. 13), and Pyraloidae (Fig. 14), further modifications of the Tineoid type.

---

[4] Zeitsch. für Wiss. Zool., LXX, 192–235, 1901. Zeitsch. für Wiss. Zool., LXXIV, 557–615, 1903.

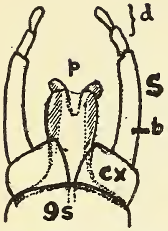
In a few of the families of Lepidoptera the juxta is entirely absent and likewise it is sometimes absent in certain species of families which are characterized by its presence. This loss of the juxta represents a high degree of genitalic specialization. The presence and type of juxta usually indicate the ancestry and relationship of the form considered and generalized tendencies in juxta development are associated with other morphological characters of a primitive nature.

The gonopophyses or valves of the Lepidoptera, like those of the higher Trichoptera, are composed of a single segment, presumably the basistylus. There is no evidence to be found in the valves of adult Lepidoptera or in their development as described by Zander to indicate the presence of the dististylus or a vestige of it. Certain authors have suggested that the " claspers " or " ampullae " which are located on the inner surfaces of the valves of some of the more specialized families represent the rudimentary dististyle. This seems hardly plausible since these structures exist only in the higher forms and are not to be found in any of the ancestral types such as the Micropterygoidea, Hepialoidae, and lower Tineoidea. In the higher Lepidoptera the valves lose their close association with the juxta and become partially or entirely articulated to the caudal margin of the ninth sternite, especially when the juxta is reduced or absent.

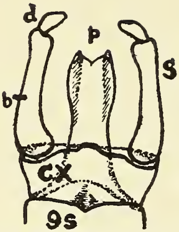
Explanation of Plate III.

1. Ephemerid based on *Leptophlebia volitans* McD.
2. Ephemerid based on *Blasturus cupidus* Say.
3. Hymenopteron based on *Megaxyela* sp.
4. Mecopteron based on *Merope tuber* Newm.
5. Mecopteron based on *Boreus brumalis* Ftch.
6. Trichopteron based on *Philopotamus* sp.
7. Trichopteron based on *Molanna angustata* Curt.
8. Trichopteron based on *Neuronia postica* Wlk.
9. Micropterygid based on *Sabatinca chrysargyra* Meyr.
10. Hepialid based on *Hepialus lupulinus* L.
11. Tineid based on *Talaeporia tabulosa* Ritz.
12. Megalopygid based on *Norape tener* Druce.
13. Tortricid based on *Tortrix politana* Hw.
14. Pyralid based on *Pyralis farinalis* Linn.
15. Zygaenid based on *Ctenucha virginica* Charp.

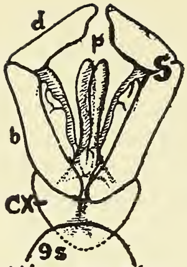
All figures represent ventral view of the structures illustrated.



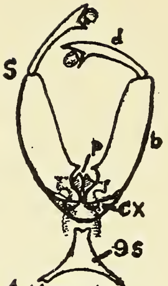
1. Leptophlebia



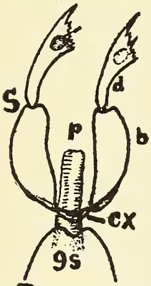
2. Blasturus



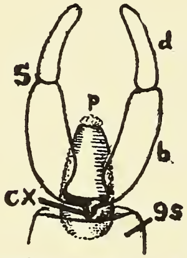
3. Megaxyela



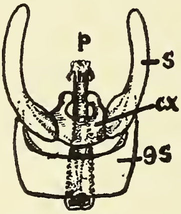
4. Merope



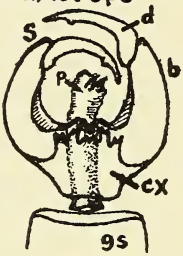
5. Boreus



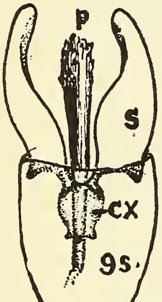
6. Philopotamus



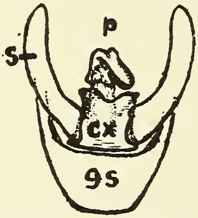
7. Molanna



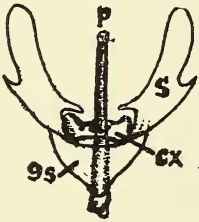
8. Neuronia



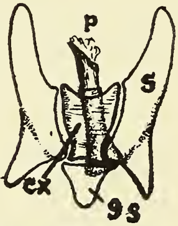
9. Micro-pterygid



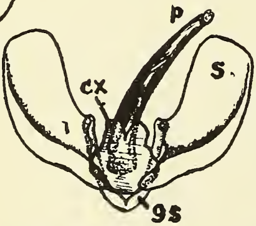
10. Hepialid



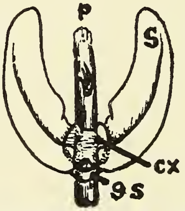
11. Tineid



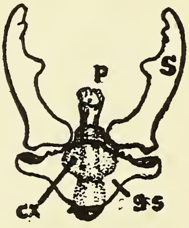
12. Megalopygid



13. Tortricid



14. Pyralid



15. Zygaenid

ABBREVIATIONS.

9s—9th sternite or vinculum.
cx—coxites, which when fused are called the basal plate or juxta.
S—gonopophysis or gonostylus.
b—basistylus of the gonopophysis.
d—dististylus of the gonopophysis.
p—penis valves or penis sheath called ædœagus in Lepidoptera.

Note on Coccinella oculata Fab.—Many specimens of this ladybeetle were observed by the writer in the District of Columbia, November 19, 1922, on the southern and sunny side of maple trees infested with aphids and scales. A dozen empty pupal skins could be seen on a single tree, especially where the bark had recently been removed. These decorticated spots were lighter and had been selected by the larvae for transformation. On these spots the beetles rested, mostly within two or three feet of the ground. It is evident that the beetles transformed the last of October or in early November; how late should be definitely ascertained, as November is very late in the season for the development of coleopterous larvae to adults and transformation in this month is not likely to occur except when there is exposure to sunlight. This species had never been noticed by the writer in such numbers before in the course of many years' collecting, nor has it been observed in that vicinity since.

An adult under observation at 2:00 P. M., October 22, was white at the time, having just transformed from the pupa. By 2:30 the elytra were slightly infuscated, showing two white spots where the red dots would later appear. By 3:45 this darkness was enhanced, and by 4:00 P. M. the elytra were quite dark although not shining black, the spots still remaining white. By 9:00 A. M., October 23, the elytra were shining black and the spots cream colored, and from this time they began to be faintly tinged with red, until by 1:00 P. M., pale red was distinct. The average temperature was 72° F.—F. H. CHITTENDEN, Washington, D. C.

A NEW GEOCORIS FROM ILLINOIS.

(Hemiptera, Lygaeidae.)

By H. G. Barber, Roselle, N. J.

Geocoris frisoni n. sp.

Brachypterous. Pale ochro-cinereous, profusely and rather evenly punctate with fusco-ferrugineous. Head very finely wrinkled, fusco-ferrugineous with the anterior area, two longitudinal ridges of the tylus, a small quadrate spot at the base of this, orbits of the eyes and a short oblique, intra-orbital, calloused streak, yellowish; beneath pale ferrugineous with a pale yellow, oblique, intra-orbital line. Antennae pale yellow with the first three segments below and more or less of the bases of these above, infuscated; the terminal segment fuscous. Pronotum almost twice as wide as long, rather flat; the lateral margins parallel, anterior angles back of the eyes, abruptly, obtusely angulated; evenly and rather closely punctate with fusco-ferrugineous to the extreme anterior and lateral margins; very narrowly impunctate along posterior margin; anteriorly with a faint, calloused, median, pale yellow streak separating the two transverse, orbicular, smooth callosities. Scutellum concolorous, as wide as long and equaling the length of the pronotum; closely and evenly punctate on either side of a delicate, median, calloused streak; basal area more sparsely punctate. Hemielytra concolorous, very little wider across these than the diameter of the pronotum; rather evenly and closely punctate all over with fusco-ferrugineous except very narrowly along costal margins which are lightly recurved along basal half of the corium, the apex of which reaches to the middle of the fifth connexival segment. Membrane clear, much abbreviated, its extent being about one half the length of the fifth tergal segment. Dorsum abdominis fusco-ferrugineous with the connexivum pale yellow. Pleura pale yellow, very finely and closely punctate with ferrugineous; anterior margin of the prosternum and regions of the acetabula, smooth. Legs pale yellow; femora faintly flecked with ferrugineous. Venter more or less infuscated laterally. Length 3.15 mm. Head L. .55, W. .725; pronotum L. .66 W. 1.10; scutellum L. .66, W. .66. Described from 30 specimens. Holotype: Male, Havana, Ill., Devil's Hole, Aug. 30, 1917. Allotype, same locality Aug. 15, 1907. Paratypes: Males 7 from Arenzville, Ill., bluff sand, Aug. 14, 1913; 5 from Havana, Ill., Devil's Hole, Sept. 28, 1913, and 1 Sept.

11, 1910; females—1 Bishop, Ill., June 22, 1906; 2 same locality Aug. 13, 1907; 2 Meredosia, Ill., sand pit, Aug. 22, 1917; 8 Arenzville, Ill., bluff sand, Aug. 14, 1913; 2 Havana, Ill., Devil's Hole, Sept. 28, 1917; 1 nymph Devil's Neck, Ill., June 7, 1905. (Holotype, allotype and paratypes in the collection of the Illinois State Natural History Museum. Paratypes in the author's collection.)

This is a pale arenicolous species found along the Illinois River and some of its tributaries. So far only brachypterous forms are known. Some specimens are darker colored, with the head above and below, the antennae, scutellum, pleura, venter and the legs more or less infuscated. Sometimes the pronotum has a broad fuscous vitta on either side of the middle line. From its closest ally *G. uliginosus* and its varieties *G. frisoni* differs, besides in color, in the more parallel sidedness of the pronotum, the relatively narrower width across the hemielytra, the more even and closer punctation on the corium and pronotum with no smooth area on the disk of the former. This species is named in honor of Doctor T. H. Frison, Systematic Entomologist and Curator of the Illinois State Natural History Survey.

NOTE ON COLLECTING ELEODES HISPILABRIS NUPTA SAY.

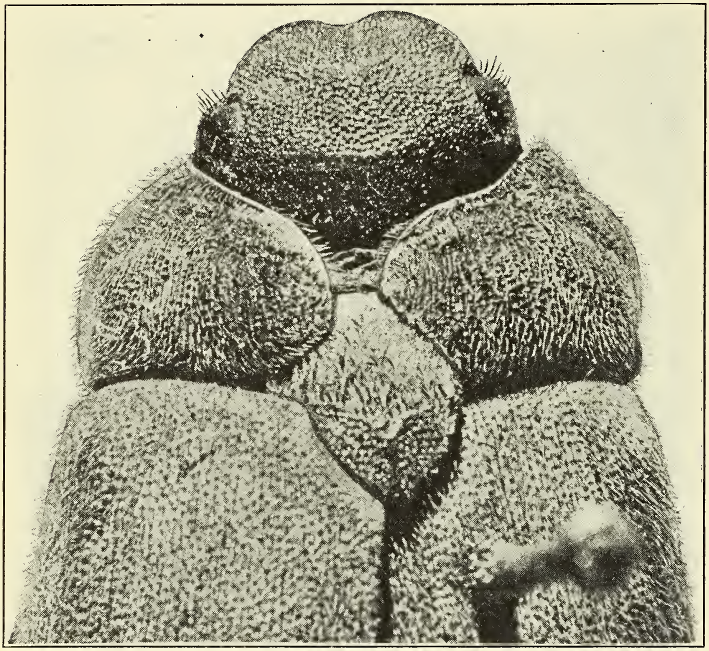
By R. H. Beamer, Department of Entomology, University of Kansas, Lawrence.

The set of twenty-four specimens of *Eleodes hispilabris nupta* Say referred to by Doctor Frank E. Blaisdell in the *Proceedings of the California Academy of Science,* Fourth Series, Vol. XIV, No. 16, pp. 384 (September 18, 1925), was collected in a rather interesting way between eight and eleven o'clock the evening of April 13, 1925. The writer had stopped for the night in the Medora Sand-hills in the hope of obtaining a few mice from this interesting region and also to spend an evening collecting insects with a gas light. Accordingly small wooden mouse traps were set at promising burrows scattered among the sand dunes. All of the traps were baited with a pinch of dry oatmeal. In the hope of increasing the catch we visited each trap twice during the evening. Almost without exception two specimens of the beetles were taken at each trap and sometimes three. In every case the beetles were devouring the oatmeal as though they were starved.

The trip was a failure as far as mice were concerned, but we did secure in a rather unique way a nice series of beetles new to the Snow Entomological collection.

A MAY BEETLE WITH THE PRONOTUM SHOWING A COMPLETE MEDIAN DIVISION.[1]

By Robert D. Glasgow, University of Illinois, Urbana, Ills.



Several examples of Coleoptera having the pronotum more or less completely divided by a median cleft have been recorded in the literature of animal teratology. Of such examples known to the writer, nine have the pronotum completely divided so as to form two separate, right and left plates; in six others, either the division of the pronotum is incomplete, and results in the formation of two lobes, one right and one left, which are more or less broadly united by the mesal margins, or the extent of the division is not indicated in the published description; while in one example described by Kraatz the pronotum is divided into three lobes, one median and two lateral.

---

[1] Contributions from the Entomological Laboratories of the University of Illinois, Number 91.

Still another example of this type of insect malformation is presented by a specimen now before the writer. This is a female specimen of *Phyllophaga ilicis* Knoch, which was found in a lot of May beetles that had been collected on the ground under electric arc lights at Dalton, Georgia, on May 10, 1910, and preserved in alcohol.

In this specimen the pronotum is completely divided on the median line into two, distinct, right and left plates which are subequal in size, which, in general shape and in position, are related to each other as optical images, and which are approximately balanced with reference to the meson as an axis of symmetry. The details are very well shown in the accompanying figure. The lateral margins of the two pieces are approximately like those of a normal pronotum. The mesal margin, however, joins the cephalic and the caudal margins of each piece in a sweeping curve, so that no cephalo-mesal or caudo-caudal angles are formed. The arcuate mesal margins of the two pieces are separated by a distance of six-tenths of a millimeter at their nearest points, and their adjacent, curved outlines result in the formation of broadly V-shaped spaces before and behind, through which the occipital region of the head and a considerable area cephalad from the scutellum are exposed. The surfaces of the two pieces are not quite so uniformly curved as are the corresponding surfaces of a normal pronotum; but the flowing curves and the clearly defined modeling of the mesal margins of the two pieces seem to suggest that the malformation has resulted rather from an imperfect closure on the mid-dorsal line in the development of the pronotum than from any probable mechanical injury to an earlier stage of the insect.

Aside from the divided pronotum this specimen seems to be normal in every respect, and the fact that it was taken under an arc light would seem to be evidence that the malformation of the prothorax did not interfere seriously with the insect's ability to fly. While the probability that anyone may ever have an opportunity to do so is remote, it would be interesting to observe the effect of this type of abnormality upon the performance of the living insect. This individual obviously succeeded in digging its way from its pupal cell to the surface of the ground, but it would seem that the division of the pronotum might well reduce the strength of the tergal arch sufficiently to impair the effectiveness of the fossorial front legs, or in some way to modify the manner in which they are employed by the insect.

It should be noted that all of the examples of this particular type of insect abnormality known to the writer belong to the order Coleoptera. It would be strange, however, if it does not appear in other orders of insects, particularly in those orders which like the Coleoptera have a large prothorax. It is hoped that students of insects may report any such malformations that may be known to them, or that may be observed by them in the future.

Indeed, every example of any notable insect malformation should be placed on record by a published description and by a statement of the place where the specimen has been deposited. Such material has type value, and should be preserved, and cared for, and made accessible to persons interested in teratology, just as the type specimens of species should be preserved, and cared for and made accessible to taxonomists.

The specimen showing the malformation here described will be placed in the type series of the insect collections at the University of Illinois, where it may be examined by anyone interested in its further study.

Early Butterflies.—The favorable weather last spring caused the early appearance of the following male forms at Fall River, Mass.: *C. L. lucia,* April 3; *T. brizo,* April 21; *I. angustus,* April 22; *T. juvenalis,* April 23.—D. Prescott Rogers, Fall River, Mass.

FURTHER ON ANNECTANT BUGS.

By W. L. McAtee and J. R. Malloch, Washington, D. C.

In this Bulletin for October, 1925, Dr. E. Bergroth has criticized at length our paper entitled Some Annectant Bugs, etc., published in the number for June, 1924.

In letters from Dr. Bergroth to the writers he intimated his intent to censure the paper, but so clearly revealed the weakness of his position that we did not believe he would have the temerity to break into print on the subject.

Our censor refers to the introduction to our paper as "pompous and self-sufficient," but as it confesses to general ignorance of the units of classification, specifically denies reflecting upon individuals. grants that many errors in previous work were unavoidable, and refrains from redefining cimicoid groupings, it seems an humble rather than a pompous introduction.

If we are not to attempt to improve upon preceding work then we are not carrying on real research and may as well become intellectually stagnant and accept everything on authority. Apparently this is the type of systematic work which Dr. Bergroth wishes to foster, but we reject it absolutely. Science does not concern itself with precedents and authorities but with verification and reverification of observations.

As to the quality of our paper we have no apology to make except for typographical errors which were not corrected as indicated on proof sheets, but for which corrections were published later.

Adverting to some of the specific criticisms we may say at first that many of them are out of place, as with one exception our paper dealt only with forms we had personally examined. Notice of this is served in our key which is restricted " to the groups treated in this paper." That our characterizations do not cover forms unknown to us is no matter for surprise, nor we add, for chagrin. Despite the irrelevance of some of Dr. Bergroth's criticisms and the general " getting nowhere " cast of his paper, we will refer in detail to some of his remarks.

Whether the beak of *Idiotropus* Fieber is to be called 3- or 4-segmented merely depends upon whether the base of the beak is reckoned as a segment or as part of the head, a point we have given some attention in a paper recently published in the Proceedings of the Biological Society of Washington (Vol. 38, pp. 145–148. 1925). When this part of the beak is long authors have counted it as a segment, when short it usually has been ignored. Unless one makes allowance for this usage, previous definitions of Microphysidae and allies cannot be understood. The beaks in all are fundamentally alike but for purposes of classification have arbitrarily been treated as 4- or 3-segmented according to whether the basal attachment was segment-like or not.

We trust Dr. Bergroth sees the implication of this feature which he has dwelt upon so unnecessarily as to the close relationships of microphysids and anthocorids. If they are fundamentally alike in structure of the beak, and if the number of tarsal segments is a character of little importance as Dr. Bergroth avers later in his critique (a view with which we wholly agree), what becomes of the family ranking of these groups? None of the principal characters advanced by Reuter remains except venational ones, and these, like the others, certainly intergrade. A glance at the figures on Plates XVI and XVII of Douglas and Scott, The British Hemiptera, should convince anyone that venation in these segregates can hardly do otherwise than intergrade. What is more important the course of veins in the membrane is hardly a character to use for family distinctions of insects among which brachyptery is so frequent.

Dr. Bergroth's unreasoned assumptions as to our ignorance of existing literature on Hemiptera are puerile. We do not believe in going into great detail in this respect, laboriously endeavoring to exhibit erudition, but we credit the readers we are addressing with a general understanding of the matter in hand. If Dr. Bergroth had maintained a like attitude when reading our paper he would have found little to criticize.

His animadversions on the structure of the beak bring us no news, and they certainly cannot be construed as a defense of separation of microphysids from anthocorids. We agree as to the unimportance of the number of tarsal segments, thought we were expressing that attitude in the paper criticized, and plainly showed such a view in our paper on Ploiariinae (Proc. U. S. Nat. Mus., 67, 1925, Art. 1) where insects with 1-, 2-, and 3-segmented tarsi were grouped in a single subfamily. Again this evidence is of no comfort to those who would separate microphysids from anthocorids.

Despite the doctor's fears as to the lack of enlightenment in Washington, we are acquainted with Reuter's Monographia Anthocoridarum and we agree with the disposition there of the groups Anthocorina, Termatophylina, and Microphysina, as subfamilies, not with their more modern elevation to families. (Cf. Poppius, Acta. Soc. Sci. Fennicae, 1909, et al.)

The name *Microphysa tenella* at which Dr. Bergroth stares his eyes out (to use his own expression) occurs in our paper only in the explanation of the plate, where some figures are given for comparative purposes. They serve to illustrate certain characters of the microphysids, and would have answered equally well without generic and specific assignment. The species is not new as Dr. Bergroth fears, but is the European *Myrmedobia tenella.* If our name for it has pained anyone we can only say that was not our intention.

On page 160 our censor says, " the genus *Idiotropus* McA. Mall. (nec. Fieb.) has all the characters of the family Microphysidae as given by Reuter in his monograph, apart from the rostrum which is three-segmented as in another Microphysid genus (*Nabidomorpha* Popp.)." Aside from the facts that Reuter defined a subfamily, not a family, in his Monograph, and that all Heteroptera, according to Bergroth's own statement on the previous page, have four-segmented beaks, this is a perfectly good statement, but the exceptions are so large a proportion of the whole, that it is merely inane.

The dimorphism of the sexes in this group is correlated with the development of the wings. Fully winged specimens resemble in form ordinary anthocorids, capsids, or the like, while brachypterous specimens are more or less racquet-like in outline as seen from above. This is true regardless of sex as racquet-shaped males are characteristic of the annectant genus *Coccivora* we have recently described.[1] In view of these considerations—inevitable agreement in structure of beak, and correlation of body form with brachyptery, it seems there is no need for the new name *Mallochiola* Bergroth.

The chief defect in our treatment of the Isometopinae according to Bergroth apparently is that " it is impossible to know from the descriptions in what groups of the family these genera should be placed in the systematic arrangement outlined by *me* (Not.

---

[1] Proc. Biol. Soc. Wash., vol. 38, pp. 145–148, 1925.

Ent., IV, pp. 4–5)." It is indeed grievous that such bland ingenuousness should be disappointed. We will remedy the matter now by stating that *Lidopus, Alcecoris,* and *Wetmorea* all have the clavus broad posteriorly, but must add that this basis for a primary division of the Isometopinae is not to be especially praised, for if brachyptery occurs in the group as it is known to do in most families of Heteroptera, the form of the clavus in insects exhibiting it will scarcely be a reliable clew to their relationships.

Now as to *Peritropis,* the fact that it has only 2-segmented tarsi was overlooked not only by Poppius, and Reuter, but so far as we have seen by every other author who has published on the group. We made no argument whatever for the importance of the character so the doctor's extended remarks on this subject are uncalled for. We said the allocation of *Peritropis* in the classification could not have been well considered—a simple truism, for how could it have been given proper consideration when some of its characters had not even been noticed? Moreover, the definition (Der Miriden, 1910) of the family Miridae by Reuter, its most profound student, provides for no exceptions to the 3-segmented condition of the tarsi. The point, therefore, was worth mentioning, but that is all; it should not have inspired heckling.

Dr. Bergroth's views as to the unimportance in classification of the number of rostral and tarsal segments cannot be stronger than ours and our paper which he so thoroughly lambasts was intended to show that such characters have been given too much importance in taxonomy, and we described the annectant forms to illustrate the point. If our critic had not been blinded by animus he would have been able to see this, and would, we hope, have refrained from wasting, and causing us to waste in reply, many printed pages that could much better be devoted to constructive articles.

The cause of the doctor's peevishness with us is no doubt our placing his name *Teratodia emoritura* gen. et sp. nov. as a synonym of his *Diphleps unica* gen. et sp. nov. which had page precedence (Not. Ent., IV, 1924, pp. 5–7). We had several good specimens of this insect while Dr. Bergroth had a male in fair condition and a female that had been killed while teneral and in which the head and thorax were more or less collapsed. The "several American hemipterists" he mentions not only agreed with McAtee and Malloch after examination of the type specimens, that the new genus *Diphleps* was described from a teneral specimen, but also that the so-called genus *Teratodia* was described from a male of the genotype of *Diphelps.*

In compliance with a request of Dr. Bergroth in a letter, we submitted the matter to "competent and unbiased hemipterists," but he will not abide by the result. Instead he still defends his *Teratodia* and refers to differences in the anterior angles of the pronotum, although it would seem that such a line of argument is strictly invalid because of the teneral character of one of the specimens. To describe two new genera from the sexes of the same species, and one of them from a single teneral specimen, is an almost unbelievable lapse to come from an entomologist of Dr. Bergroth's reputation.

* * *

News of Dr. Bergroth's death reached the writers after the present article had been accepted for publication. As its *raison d'être* was the writings, not the existence of Dr. Bergroth, we see no compelling reason for withdrawing a rejoinder that could justly have been made more pointed.

THE LIFE HISTORY AND HABITS OF EREMOCHRYSA PUNCTINERVIS McLACH (Neuroptera).[1]

By Roger C. Smith, Kansas State Agricultural College.

Three adults, two males and a female of the rare Chrysopid, *Eremochrysa punctinervis* McLach., were taken July 3, 1925, in a narrow, weedy border between an alfalfa and a sorghum field on the Agronomy Farm of the Kansas Agricultural Experiment Station. An account of the life history and description of the stages has not been published for this species, nor for any species of this genus.

While Banks (1903) states that "it (this species) appears to be the most common species of the arid region of the southwest," Kansas is almost out of its range, for it is very rare in this state (Smith, 1925), judging from collections so far seen. A previous specimen was taken in April at Manhattan, by beating evergreens in the city cemetery. In fact, evergreens have been the generally accepted habitat of this species. However, these specimens were taken at least a half mile from the nearest evergreen and about one-fourth mile from the nearest tree. The plants in this border were sweet clover, alfalfa, shepherd's purse, red root (*Amaranthus*) and some wild grasses.

One of the three specimens was a gravid female, and during the night of July 3, deposited two eggs. These eggs were stalked, oblong oval in shape, light bluish green in color, with a white but quite inconspicuous micropyle. The length of the stalk of one of the eggs was 2.75 mm., length of egg 0.85 mm., diameter of egg 0.35 mm. The eggs, in so far as the writer observed, could not be distinguished from the eggs of any other small species of Chrysopid.

---

[1] Contribution No. 351 from the Entomological Laboratory, Kansas State Agricultural College. This paper embodies some of the results obtained in the prosecution of project No. 115 of the Agricultural Experiment Station. The writer wishes to acknowledge the assistance of Dr. Nathan Banks in determining these specimens, and of Mr. S. Fred Prince in preparing the illustrations.

The egg burster (Fig. 2) on the embryonic molt differed from that of all species yet seen in that the lobe was more pointed and extended at about a 45° angle instead of nearly horizontal. The irregularities, or teeth, on the ridge were quite obscure. The total length of the burster was 0.06 mm., the length of the lobe 0.024 mm.

Embryonic development required four days, since the larvae were observed resting on the egg shells the morning of July 7. They soon came down the stalks, however, and ran about hurriedly, apparently seeking food. When small aphids were offered the larvae, they refused to eat them, and it was thought that the proper food was not being offered them. It soon became apparent, however, that the larvae were searching primarily for packet materials to place on their backs, instead of for something to eat. In fact, they would not take food until they had found some suitable packet-forming materials and placed them on their backs. This was the first indication that the larvae were trash carriers, since the general morphology was that of the naked species. Their first packets were crude and scanty, for little suitable material was available. The instinct of trash carrying was more pronounced in this species than in any yet seen. This packet was a feature of each of the larval instars, that of the third being a typical, fully completed one. When even a portion of the packet was removed, the larvae became very restless and hurriedly sought materials to complete it.

The first molt occurred July 10, and the second molt July 14. They were mature on the 16th, and the larva saved spun its cocoon the 17th. One fully grown larva was killed for drawing and study.

The following is a brief description of the mature third instar larva of this species:

> Larva, the typical trash carrier form (Smith, 1926) with shortened and humped abdomen (Fig. 1). Head of the usual Chrysopid shape, yellowish gray and somewhat translucent. Two narrow, purplish bands extended in convergent curves from antennae to the prothorax, between which was a light yellow or amber area; margins of bands somewhat irregular and bordered on each side with a prominent narrow area of gray. Exterior to these gray areas was another somewhat faint, irregular band of purplish red or lilac; jaws dark amber, translucent; antennae same at base but somewhat

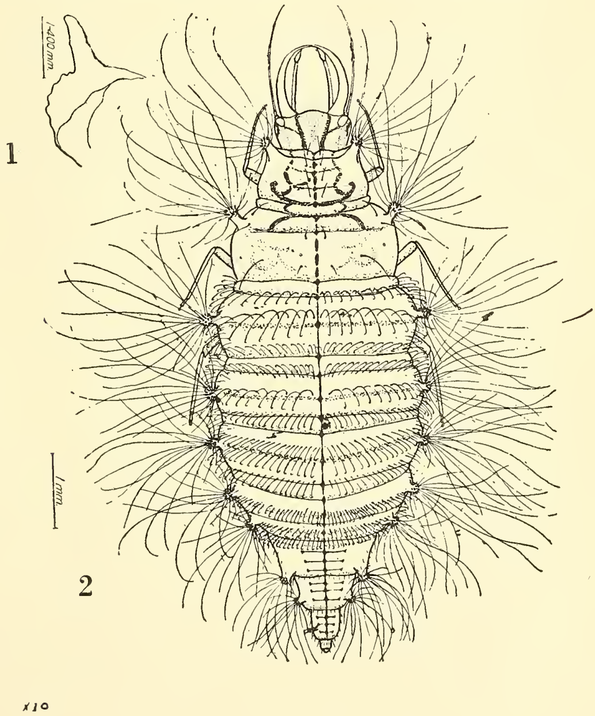
> smoky near middle and black at the tip; palpi also smoky at tip. Dorsum of thorax was gray or grayish amber, marked by two dorso-laterally purplish red bands which began as a continuation of the purple head bands and extended into the metathorax. They were darkest anteriorly and faded out gradually posteriorly. Dorsal vessel purplish red. Lateral tubercles were wholly grayish, translucent, and the stalks were short, resembling the non-trash-carriers. Setae on the tubercles were uncolored and evenly distributed on the tubercles. Rows of short hooked setae on each segment from the metathoracic to the sixth abdominal, inclusive; one, two or three rows to a segment, as illustrated; these setae were all colorless and bore prominent hooks apically which were all directed posteriorly. Legs uncolored, except tarsi black at tips. Width of head 0.5 mm., width of metathorax between apices of the tubercles 1.45 mm. Total length 4 mm.

The second instar resembled the third in general morphology and coloration, except that the colored bands on the head and thorax were brownish red instead of purple. The head bands were arranged similar to those of the larvae of *Chrysopa quadripunctata*. They differed from this species in that a spur of brownish-red arose at the middle of each middle band and extended towards the bases of the antennae. There was a prominent mid-dorsal, faded, wine-colored or dark amber-colored irregular band from the head to end of the abdomen each side of the dorsal vessel. There was more color in this species than the writer has seen as yet in a trash-carrying species. The dorsal hooked setae on the body were relatively longer than in other species and more prominent. Total length of larva, 2.6 mm., width of head, 0.4 mm. The first instar had no distinctive color pattern until near the end of this stage, when that of the second instar began to appear.

In general, the color pattern differed from that of all other trash carriers seen. The head pattern reminded one somewhat of *C. plorabunda,* which is the most common species of this region, but the purple or lilac color is distinctive, likewise the gray border of each head band. The stalks of the tubercles were much shorter than those of other trash carriers, as, for example, *C. cockerelli,* and the setae from the thoracic tubercles were not arranged fan-shaped. There was a purplish-red color pattern on the dorsum of the thorax. Ordinarily there is no body color-pattern in the trash carriers. The dorsal hooked setae were much longer and more prominent than those observed on any other trash carrier. They were readily seen even with low powers of magnification. In the other trash carriers, they were quite obscure and were early overlooked by the writer.

The larvae were reared upon aphids on sunflowers, since these plant lice happened to be plentiful at the time and the larvae readily fed upon them. The adults were given aphids also, but they were not observed to eat them. They accepted water and sweetened water, and drank freely on several occasions. This species, because of its rarity in eastern Kansas at least, is, of course, not an important factor in aphid control.

The cocoon did not differ from that of other small species of Chrysopids. It was almost perfectly spherical, 2.7 mm. in diameter. It was partially covered with aphid skins, bits of leaf fragments and some other unrecognizable materials. The larva saved spun its cocoon July 16, but it died in the pupal stage.



It is difficult to place this species definitely into any particular ecological group, since one specimen was taken on evergreens and these three on herbage in a cultivated field. The brownish coloration of the adult renders it quite well protected at least from the eye of man, either among the brown needles, cones and bud scales of pine, or on the dried vegetation of the prairie.

Bibliography.

Banks, Nathan. A revision of the nearctic Chrysopidae. Trans. Amer. Ent. Soc., 1903. 29: 137–162. 1 pl.

Smith, Roger C. The trash-carrying habit of certain species of Chrysopidae (Neuroptera). Scientific Monthly, 1926. 21.

Smith, Roger C. The Neuroptera and Mecoptera of Kansas. Bul. Brooklyn Ent. Soc., 1925. 20: 165–171.

Explanation of Figures.

1. Egg burster of *Eremochrysa punctinervis,* greatly enlarged.
2. Dorsal view of a fully grown third instar larva of *E. punctinervis* with packet removed to show dorsal head pattern, lateral and curved dorsal setae.

FURTHER RECORDS OF HETEROPTERA FROM MASSACHUSETTS.

By J. R. de la Torre-Bueno, White Plains, N. Y.

Mr. C. A. Frost, of Framingham, continued to send me throughout 1924 the Heteroptera of his collecting during the year. They present a number of new records for the state and one for New England—*Ochterus banksi* Barber. The locality and date of each is as given hereafter. The arrangement, for easy reference, follows the order in Parshley's Fauna of New England paper:[1]

Eurygaster alternata Say, Sherborn, 29. VI.
Galgupha atra A. & S., Sherborn, 29. VI.
Amnestus spinifrons Say, Sherborn, 25. V.
Podops cinctipes Say, Natick, 27. IV; Southboro, 30. V.
Brochymena arborea Fab., Sudbury, 18. V; Sherborn, 28. IX.
B. carolinensis Westw., Sudbury, 18. V; Sherborn, 25. V (in cop.).
Chlorochroa uhleri Stål, Sherborn, 29. VI.
Euschistus politus Uhler, Sherborn, 5. IX.
E. tristigmus Framingham, 17. V; Southboro, 7. VI and 30. V.
E. variolarius P. B., Sudbury, 19. X; Sherborn, 21. IX.
Acrosternum hilare Say, Southboro, 30. V.
Banasa dimidiata Say, Southboro, 30. V.
Dendrocoris humeralis Uhler, Southboro, 7. VI; Sudbury, 15. VI; Sherborn, 29. VI.
Meadorus lateralis Say, Sudbury, 18. V.
Stiretrus anchorago fimbriatus Say, Southboro, 30. V.
Perillus exaptus Say, Sherborn, 5. V.
Apateticus cynicus Say, Sherborn, 24. VIII.
Podisus maculiventris Say, Southboro, 30. V; 7. VI.
P. serieventris Uhler, Sudbury, 15. VI.
P. modestus Dallas, Southboro, 7. VI.
P. placidus Uhler, Sudbury, 25. VI.
Corynocoris distinctus Dallas, Sherborn, 21. IX.

---

[1] Occasional Papers of the Boston Society of Natural History, VII, Fauna of New England, 14. List of the Hemiptera-Heteroptera, 1917.

Protenor belfragei Haglund, Sherborn, 21. IX.

Corizus lateralis Say, Sudbury, 15. VI.

Aradus robustus Uhler, Framingham, 17. V (adult); Sherborn, 25. V (nymph); Southboro, 30. V (nymph).

A. cinnamomeus Panzer, Sherborn, 5. IV.

Cymus angustatus Stål, Framingham, 17. V.

C. discors Horváth, Ashland, 4. V.

Phlegyas abbreviatus Uhler, Sudbury, 18. V.

Oedancala dorsalis Say, Sherborn, 5. IV; 28. VI.

Antillocoris pallidus Uhler, Natick, 27. IV; Ashland, 4. V.

Peritrechus fraternus Uhler, Sudbury, 15. VI.

Trapezonotus arenarius Linné, Sudbury, 18. V. The only other New England record is also from Massachusetts.

Emblethis vicarius Horváth, Sherborn, 21. IX.

Scolopostethus thomsoni Reuter, Ashland, 4. V.

S. atlanticus Horváth, Natick, 27. IV.

Corythucha cydoniae Fitch, Southboro, 30. V.

C. pergandei Heidemann, Framingham, 17. V; Ashland, 4. V.

Physatocheila plexa Say, Framingham, 17. V; appears not to have been heretofore reported from the state.

Hebrus burmeisteri L. & S., Natick, 27. IV (2 apterous); Ashland, 4. V (apterous). These early season individuals secured by sifting seem to be ordinarily apterous.

Gerris marginatus Say, Framingham, 17. V.

G. buenoi Kirkaldy, Natick, 27. V.

Notonecta variabilis Fieber, Natick, 27. IV.

Ranatra kirkaldyi Bueno, Natick, 27. IV.

R. americana Montandon, Natick, 27. IV.

Belostoma flumineum Say, Natick, 27. IV.

B. lutarium Stål, Natick, 27. IV.

Ochterus americanus Uhler, Framingham, 5. VIII. 24. There are only two other records of this species for New England, both from Massachusetts, one doubtful and the other from the literature.

O. banksi Barber, Sherborn, 28. VI. 24. This species is here recorded for what appears to be the first time from New England. It does not appear either in Parshley's original list nor in his subsequent additions.

Arctocorisa interrupta Say, Natick, 27. IV.

A. nitida Fieber, Sherborn, 5. IV.

A. nitida, var. *minor* Abbott, Ashland, 4. V; Sherborn, 5. IV. This variety seems not to have been recorded from New England heretofore.
A. kennicottii Uhler, Natick, 27. IV.
A. lucida Abbott, Framingham, 17. V.
A. alternata Say, Sudbury, 18. V.
A. compressa Abbott, Sudbury, 18. V. There is only one other Massachusetts record given by Parshley.

These few records are presented for the proper study of distribution of Heteroptera, whose areas, owing to the advance of urban life, to the changes in agriculture, and to other man-made differences, are little by little changing, and at times, suffering great restriction and even disappearance. In a sense, distributional records of Heteroptera for the most part mean merely the distribution of hemipterists or collectors of Hemiptera, rather than the restricted dispersal of species.

TO OUR SUBSCRIBERS.

You will find enclosed in this number the usual slips for renewal of subscriptions. We anticipate that a greater number than usual will renew promptly.

This BULLETIN has always followed a most liberal policy in regard to delinquent subscribers; and only under exceptional circumstances and most reluctantly cancellations for failure to pay subscriptions have been made. As a result we have outstanding on our books a sum equivalent to 160 subscriptions, some of these subscriptions (but not many) going back three, and (a very few), four years.

With the high cost of printing always with us, it is necessary to call on all our resources to enable us to maintain the standard we have attained.

We trust, therefore, that our subscribers will cooperate with us by paying their subscriptions very promptly; and that those in arrears will pay in full to date.

Of course, if *you* have already paid your subscription, it will be very helpful to our BULLETIN as well as to our readers, if you will use the blank to secure us another subscriber. In fact, if every subscriber will aid us in this way, it will be possible not only to maintain our standard, but also to make it higher.

J. R. T. B.

DESCRIPTION OF A NEW RENODAEUS FROM TEXAS (Hemiptera, Miridae).[1]

By Harry H. Knight, Ames, Iowa.

Renodaeus texanus n. sp.

Distinguished from *ficarius* Dist. by the constricted anterior half of prothorax, the strongly convex basal half of pronotum, and the smaller size; in *ficarius* Dist. the pronotal disk is most strongly convex on anterior half.

> ♀. Length 2.7 mm., width across apical area of hemelytra 1.02 mm. Head: width .77 mm., vertex .45 mm. Rostrum, length 1.03 mm., reaching to near posterior margins of middle coxae. Antennae: segment I, length .20 mm., thickness .06 mm., pale yellowish, a reddish mark on middle; II, .57 mm., slender, thickness .043 mm., abruptly enlarged at apex to a thickness of .085 mm., brown, darker at base; III, .30 mm., slender at base but much thickened (.071 mm. thick) on apical half, dark brown; IV, .34 mm., fusiform, thickness .095 mm., dark brown; clothed with very fine pale pubescence; thus the thickened antennae suggest a relationship with *Ceratocapsus.* Pronotum: length .71 mm., width at base .81 mm., width at anterior angles .60 mm.; anterior two-fifths of prothorax narrower than head, rather distinctly constricted just before the flaring and strongly convex basal half of pronotal disk, the basal margin convexly arcuate, but distinctly impressed at a point just inside of the line where claval suture meets pronotum, the basal angles thus set off and sharply rounded; as viewed from above the lateral margins of disk strongly concave, appearing constricted at middle and having a diameter slightly less than anterior angles; as viewed in profile the anterior two-fifths of pronotum is about level with base of head, but behind that point very strongly convex, then curving down to basal margin which is on a horizontal plane with the hemelytra, and if projected this plane would strike at a point only a little above middle of eyes. Pronotum and head moderately shining, clothed with pale yellowish simple pubescence. Scutellum small, triangular, flat, smooth or somewhat alutaceous, the mesoscutum and the basal margin of scutellum covered by the abruptly arched basal lobe of pronotum.

---

[1] Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

Hemelytra with embolar margins sinuate, slightly constricted on basal half; corium longitudinally convex, the clavus more nearly flat, the membrane short, scarcely covering apex of abdomen; color fusco-brownish, inner apical angles of corium darker, cuneus dark brown, shining; clavus and corium set with many erect, black bristle-like hairs, the length of many equal to width of scutellum, with two bristles at least on base of scutellum, the cuneus clothed only with recumbent, golden yellow pubescence; apical margin of corium and extending across to near apex of clavus provided with a band composed of thickly set silvery scales, also with two short bands or spots of similar scales on basal half of corium, set between radial vein and the much narrowed embolium; clavus with a V-shaped silvery band at middle, the base of the "V" placed against claval commissure, and a second silvery spot set at a point half way toward apex of clavus; membrane fusco-brownish, rather strongly shining bordering cuneus and apex of corium. Sternum brownish translucent, shining; ostiolar peritreme white, projecting more strongly than in the genus *Pilophorus*. Legs broken; coxae pale although more or less brownish at base and apex. Venter reddish to dark brown, shining, more reddish on basal half, broader apically, the ovipositor occupying about two-thirds the length of abdomen.

Holotype: ♀, Brownsville, Texas; Cornell University collection.

The genus *Renodaeus* was originally described by Distant (Biol. Centr.-Amer., Het. I, p. 461, 1893) as an aberrant genus of the family Pyrrhocoridae. My attention was first directed to this genus by Mr. W. E. China, of the British Museum, and Dr. R. F. Hussey, who found that *Renodaeus* belongs to the family Miridae. I am also indebted to Mr. China for sketches and notes which he made of the genotype, *Renodaeus ficarius* Dist., with the aid of which I am able to recognize the present new species from Texas. For some time I had regarded this unusual Mirid as representing an undescribed genus, but fortunately my attention was directed to *Renodaeus* Dist. before I got to the point of describing it. *Renodaeus* has the thickened antennae of a *Ceratocapsus* but with the head and hemelytra of a *Pilophorus*. Since I am unable to place it in either the *Ceratocapsini* or *Pilophorini*, I propose to make the genus *Renodaeus* Dist. the type of a new tribe which may be known as the *Renodaeini* in the subfamily Orthotylinae. Although I am unable to examine the arolia due to the broken legs, I have no doubt but they are similar to those of *Pilophorous* and *Ceratocapsus*.

BOOK NOTE.

Bird Islands of Peru, by Robert Cushman Murphy. (Putnam's, New York. $6.)

As I read through this book, again I smelt the *garúa,* chilly, penetrating, damp; again I saw the pale sun struggling through the powdery rain floating impalpable in the air; again I saw the Island of San Lorenzo, rocky and austere, athwart the blue heaving waters of Callao Bay; again I saw the Cerro de San Cristóbal, cannon-crowned, and the yellow *amancáes* decking its rocky slopes; and far in the distance, like white-rimmed clouds blue and low in the East, the ghostly Andes. And I longed to be in the ancient and noble City of the Kings, under its sapphire skies, in the fragrance of starry jasmines and purple passion-flowers, green *chirimoya* blossoms and golden *aromas*—in Lima, by the murmuring Rimac, the city where I was born and which I may never again see. Once more I wanted to sail in the slow stretching surges of the vast blue Pacific, coasting by glaring desert sands and green and lovely river valleys.

Dr. Murphy's book relates to one of those significant expressions of the workings of nature which constitute the permanent wealth of nations when understood and rightly fostered. He practically considers every aspect of the guano industry of Perú and touches on its fisheries. To do this, the entire subject of the coastal climate of Perú, its causes and effects, is reviewed. The control of the climate on other than the marine and bird fauna is not touched upon. But my reason for bringing this work to the notice of my fellow-entomologists is this: It assembles in one work much scattered data regarding one of the curious regions of the earth's surface, a section where insects have been but little studied.

Recently, I had occasion to review in a preliminary way the Heteropterous fauna of Perú for an essay presented before the Third Pan-American Scientific Congress in 1924. Out of 211 species listed (excluding Miridae), from within the territorial limits of this Republic, only five have been recorded from the Pacific littoral. All the others are from the Amazonian basin, and comprize mainly common or known tropical American forms. Those species so far known from the arid coast are *Dysdercus peruvianus, D. ruficollis, Nysius spurcus, Geocoris ventralis* and the universal *Cimex lectularius.* Now, of these, *D. peruvianus* and *D. ruficollis* are naturally to be found in the cultivated river valleys of the coast; *Nysius* is more or less psammophilous or desert-loving, and *Geocoris* frequents the same places as *Nysius,* seemingly as a predator. Yet, where is the assemblage of typically desert species, of which there must be an abundance in such a favorable environment? Where are the Alpine forms which should be found in the sterile higher slopes and plains of the Andes?

Dr. Murphy's work should be in every faunal entomologist's library, because, in addition to its general biological and climatological value, it affords a basis for a distributional study of the insect fauna of a very unusual corner of the earth.—J. R. T. B.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

BUTTERFLY COLLECTORS.—Have you aberrations or freak butterfly specimens for sale or exchange? Professional and private collectors please write. Jeane Gunder, Pasadena, Calif.

NEW ARRIVALS.—From Colombia, French Guiana, and Brazil. Brilliant tropical Lepidoptera for scientific and decorative purposes. H. S. Parish, 81 Robert St., Toronto, Ont., Canada.

ARKANSAS INSECTS.—Am again collecting. Have Lepidoptera on hand. Miss Louise Knobel, Hope, Ark.

CORRESPONDENCE INVITED from all those interested in Hungarian Insects—Coleoptera, Lepidoptera, Hymenoptera, Hemiptera, etc.—Prof. Charles Sajo, Oerszentmiklos, (Comitat Pest), Hungary.

CYNIPIDAE.—Galls and bred wasps wanted to determine or in exchange. Alfred C. Kinsey, Indiana University, Bloomington, Indiana.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

WANTED.—Pentatomidae, Cydnidae, and Scutelleridae from all parts of the United States for determination or exchange. Dayton Stoner, State University of Iowa, Iowa City, Iowa.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

WANTED.—Ants from all portions of the United States for determination or exchange. Will also exchange other insects for ants. M. R. Smith, Assistant Entomologist, State Plant Board, A. and M. College, Miss.

MISSISSIPPI INSECTS.—Will collect in all orders. Correspondence solicited. Miss Sophie May Newbern, Cedar Bluff, Miss.

WANTED.—Records N. Y. State Rhopalocera for check-list, all species and localities desired for a table showing the distribution throughout the State. James L. Angle, Librarian Rochester Municipal Museum.

Wanted--Butterfly Aberrations

If you or your friend find an oddly marked or colored butterfly, I would like to hear about it.—These kinds of freak butterfly specimens are my personal hobby, and I am not a dealer.—If you are selling your collection, it is better to dispose of those specimens separately, to realize more.—Correspondents always promptly answered.

JEANE GUNDER, Pasadena, California

COMSTOCK'S

Introduction to Entomology

The complete work includes Part I as issued in 1920, *revised* and Part II, devoted to the classification and the life histories of insects.

$6.00 Net

About 1044 pages

1228 Illustrations

Buckram Cloth Binding

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

List Nr. XIII

Gratis on Request, text English

All prices net in U. S. dollars. Contents **Lepidoptera, Coleoptera and other insects,** books, pins, etc.

Original Collection of Fassl: Heterocera (also Agrias) with many rarities, single ♀♀, types, etc.

We have the greatest store in the world of Lepidoptera, Coleoptera and other insects.

Dr. O. Staudinger & A. Bang-Haas
Blasewitz, Dresden, Germany

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147 Butterflies for trays,
192 All glass mounts,
205 North American Lepidoptera,
249 Exotic Lepidoptera,
212 Insect pests, Summary of collections,
213 Exotic Coleoptera,
214 North American Coleoptera,
234 Insect collections,
229 Life histories of insects,
254 List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

XXI JUNE, 1926 No. 3

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

1872

SMITHSONIAN INSTITUTION
JUL 31 1926
NATIONAL MUSEUM

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 70 cents Subscription, $1.50 per year

Mailed July 23, 1926

Entered as second-class matter January 21, 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1926

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
E. L. BELL

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
G. P. ENGELHARDT

CONTENTS

THE BLOOD OF INSECTS, Haber 61
NINE NEW BRYOCORINAE, Knight 101
HETEROPTERA FROM THE CANAL ZONE, Bueno 108
UNDESCRIBED SPECIES OF LIMNOPHILA FROM EASTERN N. A.—I, Alexander 109
REMARKS ON TINGITID NAMES, Bueno 116
NOTE ON MACROBASIS MURINA LEE, Chittenden 118
AN AMERICAN SPECIES OF PACHYPAPPELLA, Macdougall 119
TWO NEW NAMES AND A CORRECTION IN SYNONYMY, Fall 125
UNDESCRIBED TINGITID FROM ARIZONA, Drake, ... 126
WASPS AS WATER-STRADDLERS, Davis 127
JOHN CASSIMIR WRIGHT, Engelhardt 128
LIMNOMETRA SKUSEL, Bueno 129
EDITORIAL: ENTOMOLOGICA AMERICANA 130
AMONG THOSE NOT PRESENT, J. R. T. B. 131
PROCEEDINGS OF THE SOCIETY 132

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXI June, 1926 No. 3

I. THE BLOOD OF INSECTS, WITH SPECIAL REFERENCE TO THAT OF THE COMMON HOUSEHOLD GERMAN OR CROTON COCKROACH, BLATTELLA GERMANICA LINN.*

II. THE APPEARANCE OF LIPOMICRONS (MICRO FAT PARTICLES) IN THE BLOOD OF BLATTELLA GERMANICA LINN.

III. THE TRACHEAL SYSTEM OF THE GERMAN COCKROACH, BLATTELLA GERMANICA LINN.

By Vernon R. Haber, State College, Pa.

To the Department of Entomology of Cornell University the investigator is especially indebted for the assignment of a desk at which to work and for the courtesies shown during the investigations.

The cockroaches which were used in these investigations were caught in the natural habitat in a trap wherein they could not be injured, Fig. 1. Specimens which long were kept in captivity were confined in special cages, such as is shown in Fig. 4. The moisture of the air in such a cage was kept so high that there was a fine condensation upon the walls of the cage bottles at all times, and the temperatures were as stated in various parts of the investigation records.

Analysis of Cockroach Body.

Ordinarily, normally the body of a cockroach contains a high percentage of water.

---

* A resume of a thesis which was presented to the Faculty of the Graduate School of Cornell University in partial fulfillment of the requirements for the degree of Doctor of Philosophy. June, 1924.

The average percentage contents of different substances in the body of the cockroach are as set forth in the following table. There were thirty-one of the younger nymphs and they were about three days old when the investigations were made. Two older nymphs which were about ready to make the final molt, two adult males and two adult females were used. A comparative table of the averages obtained is as follows:

TABLE No. 3.

	Average water per cent.	Average organic matter per cent.	Average ash per cent.
Adult males	68.84	30.19	.0942
Adult females	66.78	31.76	1.135
Older nymphs	66.85	31.95	1.186
Younger nymphs	79.21	17.90	2.88
Grand averages	70.24	27.95	1.535

The foregoing investigations were made merely to see how the results would check with those obtained from similar experiments of other investigators. Bodine, 1893--1921, working with certain species of grasshoppers obtained similar results with young and matured material as did Babcock, 1912, with clothes and bee moths.

FACTORS INFLUENCING SELECTION OF HABITATS BY COCKROACHES.

Later on in the thesis it will be seen that the ease with which cockroaches bleed is influenced by the relative humidity of the habitat from which they come, etc.

From some thirty observations made upon temperature and relative humidity in five separate natural habitats, it was revealed that the average temperature was 20.6 degrees C. or 69.08 degrees F. and the relative humidity was 71.9 per cent. By experimentation with a T-tube it was learned that if one end was supercooled while the other was superheated, the temperature of the air in the tube exactly midway between the superheated and the supercooled ends was half the difference between that of the two ends. It was then assumed that after the air in the middle of the tube was as stated, then from one end of the tube to the other, the temperature of the air inside gradually approaches that of either extreme. Then apparatus was fitted up to test out distribution of cockroaches in a tube the relative humidity and temperature of the air of which was known. The relative humidity was obtained and maintained by bubbling air through distilled water for 100 per cent., by passing it through a saturated sodium chloride solution for a relative humidity of about 70 per cent. and by forcing it through concentrated sulfuric acid for less than 1 per cent. relative humidity. The jet of air was finely broken up as it passed through the respective solutions, so that the air automatically lost moisture to or took it from each respective solution, each giving a different relative humidity percentage to the air which was bubbled through it. The above mentioned materials are such as were used by Dr. Headlee, communicated to Dr. Wm. A. Riley in a letter in 1919. A glass tube which was about two feet long and one and one-sixteenth inches in diameter was selected. It was divided into eleven equal zones throughout its length, and the temperature per zone from the cooled to the heated extreme readily was calculated. A diagram of the apparatus is shown in Fig. 5. It was interesting to note that when the relative humidity was about 70 per cent. the cockroaches grouped themselves in zones the temperatures of which averaged 22.5 degrees C. or 72.5 degrees F. Some of the individuals left the zones of more favorable temperature and relative humidity, but it was with considerable caution, and even then they soon returned.

This experiment further revealed that, within reasonable limits, at lower temperatures cockroaches of this species seek seclusion in places the relative humidity of which is higher as compared to places in which the temperature is higher, for in the latter they sought seclusion in quarters the relative humidity of which was comparatively low. In other words, within reasonable limits, the lower the relative humidity, usually the warmer the seclusion quarters sought by *Blatella germanica* Linn., or the higher the relative humidity, usually the cooler the places of seclusion sought by them. When the relative humidity was too low, the cockroaches lost water to the surrounding air, as was shown by condensation of moisture upon the walls of the tube where the individuals were massed. In this respect my results agree with those of Bodine, 1893–1921, as he worked with grasshoppers.

To preclude the influences of light upon the behavior of the cockroaches, the experiments were made in a photographic darkroom, the lights of which were turned off excepting at times during the taking of readings, observations, the arrangement of apparatus and of the material.

It is believed that the foregoing discoveries offer an explanation for cockroaches seeking comparatively warm, moist seclusion quarters in the natural habitat. The wax glands produce a waxy secretion, Dusham, 1918, which presumably keeps the body of proper moisture under ordinary circumstances. Cockroaches which were exposed until such moisture was lost bled with as much difficulty as did starved individuals.

In fifty-seven experiments in which the relative humidity was about 70 per cent. it was found that due to cold cockroaches became inactive at from 0 to 10 degrees C., the average being 5.02 degrees, at an average thermal range of 6.9 degrees C. over an average length of time of four minutes and thirty-six seconds.

In twenty-seven experiments in which the relative humidity was about 70 per cent. it was found that due to excessive heat cockroaches became inactive at from 40 to 54 degrees C., the average being 48.1 degrees C. at an average thermal range (twenty-two cases) of 14 degrees C. over an average length of time of four minutes and eighteen seconds.

Cockroaches were more passive to colder temperature extremes when the relative humidity of about 70 per cent was maintained at a constant. Those which became inactive as a result of exposure to cold became active more readily when returned to the natural habitat than did those which became inactive as a result of exposure to heat. Cockroaches could better withstand exposure to extremes of cold over extensive time intervals than they could to extremes of heat. Some which became inactive as a result of exposure to heat extremes remained so for several days, but finally again became active. Others were killed as a result of such exposure, and upon them a white fungus developed after several days.

INSECT BLOOD

Landois, 1864, experimented with fourteen different species of insects, and as a result of his investigations concluded that insect blood characteristically is of alkaline reaction, but Poulton, 1885, learned that the blood of phytophagous larvae and their resultant pupae (Lepidoptera) reacts acid to neutral litmus; Muttkowski, 1923, says that insect blood reacts alkaline or neutral to moist litmus, but that the reaction changes to acidic just before death. The investigator tested the blood of forty-two different species of insects which he recently had captured in the field. An antenna or a leg was clipped and the forthcoming blood droplet was tested with neutral litmus. As a result of his investigations he has concluded as follows:

Of all Orthoptera, Homoptera, Heteroptera, boring larval Lepidoptera, two phytophagous larval Lepidoptera and of two Coleoptera, one of the family Cerambycidae, the other of the family Carabidae, the blood reacted alkaline to neutral litmus.

Of all phytophagous Coleoptera, pollen eating Coleoptera, carnivorous Coleoptera and phytophagous larval Lepidoptera excepting two species, the blood reacted acid to neutral litmus.

Of all Diptera which were examined the blood reacted alkaline to neutral litmus. The blood of larval *Carpocapsa pomonella* reacted alkaline to neutral litmus, but the sap of the apple pulp upon which it was feeding gave a decided acid reaction.

The blood of certain phytophagous larval Lepidoptera reacted alkaline, while that of certain others reacted acid. The blood of a pollen eating beetle, *Cyllene robiniae,* a cerambycid, reacted alkaline; while that of others, *Chauliognathus,* a lampyrid, and of *Trirhabda,* a chrysomelid, reacted acid.

The blood color of representatives of different families of the same order of insects may differ, although the individuals feed upon the same host species. The blood of certain carnivorous Coleoptera (Coccinellidae), reacts acid and is of reddish, orange or yellowish color; while that of others (Carabidae) reacts alkaline and is of turbid white color.

The blood of adult phytophagous Coleoptera which came under observation is of yellow color, while that of phytophagous larval Lepidoptera feeding upon the same host species as those of the Coleoptera usually is of greenish color.

The foregoing results indicate that blood color modifications are of little taxonomic value, a fact which was pointed out by Milne-Edwards, 1835–36; and later by Poulton, 1885.

The results of these experiments show that influences other than the color of host sap act in the coloring of the blood, for insects of different species feeding upon hosts of the same species have blood which may present color differences and which may be of different color than is that of the host sap or tissues upon which the insects feed; that insects of different species feeding upon hosts of the same species may have blood which reacts differently and that the reaction of the blood may be different from that of the sap or the tissues upon which the insects feed. The results of the foregoing researches are in accord with those of Landois, 1864, and of Poulton, 1885.

The investigator agrees with certain others, that at least certain immature insects bear more blood in proportion to body weight than do adults, for from adult individuals of *Pontia rapae* little blood was obtainable, whereas larval individuals of the same species yielded blood in profuse abundance. Others who have reached similar conclusions are Landois, 1864, and Miall and Denny, 1886.

According to the foregoing it is believed that the acidity, alkalinity and the color of insect blood must be species specificities and are influenced by more than just the food which the insect takes. Living insects of the same species in the same life cycle phases normally have blood of the same chemical (acid or alkaline) reaction, and usually of the same color.

The following excerpt from table No. 6 may be of interest in substantiating what already has been stated, as well as what is to follow:

Table No. 6.

Host	Insect	Order	Family	Reac.	Remarks
Robinia pseudo-acacia	*Cyllene robiniae*	Coleoptera	Cerambycidae	Alk.	Watery clear
	Ecdytolopha insiticiana	Lepidoptera	Tortricidae	Alk.	Whitish
	Epargyraeus tityrus		Hesperiidae	Alk.	Clear Green
Asclepias syriaca	*Euchaeitas egle*	Lepidoptera	Lymantriidae	Acd.*	Amb. Yellow
	Tetraopes tetraophthalmus	Coleoptera	Cerambycidae	Acd.	Amb. Yellow
	Anosia plexippus	Lepidoptera	Nymphalidae	Alk.*	Clear Green
	Doryphora clivicollis	Coleoptera	Chrysomelidae	Acd.	Amb. Yellow
Solidago canadensis pollen	*Cyllene robiniae*	Coleoptera	Cerambycidae	Alk.	Watery clear
	Trirhabda		Chrysomelidae	Acd.	Yellow
	Chauliognathus		Lampyridae	Acd.	Amb. Yellow

In the foregoing table, Reac. means the reaction to neutral litmus; Alk. signifies an alkaline and Acd. an acid reaction to neutral litmus; Amb. means amber, and the * means that the action was faintly as indicated.

Of the insects which fed upon black locust at some time during their development, it is interesting to note the wide color differences in the blood, and that all reacted alkaline to neutral litmus. See under *Robinia pseudo-acacia.*

Of those which feed upon milkweed, *Asclepias syriaca,* there is a difference in blood color and in reaction to neutral litmus. Of the Coleoptera, one of the family Chrysomelidae, another of the family Cerambycidae, the blood colors and the reactions to neutral litmus agree.

Of those taken while feeding upon the pollen of goldenrod, *Solidago canadensis,* all Coleoptera, there were differences in blood color and in reactions to neutral litmus.

Long ago the early microscopists, Malpighi and Leeuwenhoeck saw that the blood consists of formed bodies and of fluid plasma. Ordinarily the constituents of the blood plasma and those of the corpuscles are difficult to separate by hard and fixed lines, for it seems that some of the products of each are more or less interchangeable, as has been revealed by the researches of Newport, 1845, Wooldridge, 1884–5, Haycroft and Carlier, 1888, Cuénot, 1896, Nicholls, 1906, Lübben, 1907, Crawley, 1909 and subsequent workers. There is little doubt that the blood corpuscles draw their nourishment from the blood plasma. Edwards, 1835–6, Cuénot, 1896, and Lübben, 1907, believed that the vitalizing properties of blood are due to the corpuscles. Newport, 1845, and Cuénot, 1896, regarded them as floating, secreting glands. Newport, 1845, wrote that the blood continuously is changing due to the agency of the corpuscles and that the corpuscles are nourished by the blood plasma. Stokes and Wegefarth, 1897, believed that the granules of blood dust are shed from the leucocytes, Nicholls, 1906, regarded them as of diverse origin, and Crawley, 1909, believed that they come from erythrocytes.

Ordinarily the blood corpuscles of a cockroach are of opaque white color, this due to the white granules which they contain. In several instances it was noticed that the corpuscles were comparatively clear or hyaline and that at the same time the plasma was more heavily charged with white granules which appeared very much like those ordinarily noticed in the corpuscles. Although the writer did not see such granules leave the corpuscles, he is inclined to believe that those in the plasma come from the corpuscles.

In the following experiments each individual cockroach was kept confined in a small straight vial wihch was provided with a perforated screened cork, 1, 2 and 6 of Fig. 6. The perforation was provided with a loosely fitting bit of saturated sponge when it was desired to maintain a high relative humidity in the vial, see *s* of 6 of Fig. 6. Furthermore a small glass plate, 4 of Fig. 6, with width equal to the inside diameter of the vial was placed into it, and beneath it was flooded with water, 5 of Fig. 6. If desired, food was placed into such an individual cage, otherwise a cockroach confined in it could eat nothing, but could get any desired amount of water. For experimenting in the natural habitat, no extra water was supplied (there was no sponge in the perforated cork and no water beneath the glass plate). If provided with only dry food in a dry habitat, in several days or even in shorter periods, depending upon the relative humidity and the thermal status of the air of that habitat, it became difficult to obtain blood from individuals thus kept. To substantiate the foregoing statement, Newport, 1845, Miall and Denny, 1886, Bruntz, 1908, and Muttkowski, 1923, state that blood quantity varies according to the nutrition status of the individual. My investigations show that in an otherwise favorable habitat with water always at their disposal, but absolutely starved with regard to other foods some cockroaches bled almost as freely and as copiously after eighteen days as they did at the outset of the experiment. Some of the individuals were bled several times during the above stated interval. All had starved to death at the end of twenty-one days with nothing but water at their disposal at a relative humidity of 100 per cent. and at an average temperature of 22 degrees C. or 81 degrees F. Usually males died first, followed by younger nymphs, older nymphs and adult females in the given order.

Ordinarily to the unaided eye, the fresh whole blood of the German or Croton cockroach may have a clearness like that of water, or but a slight to a comparatively heavy turbidity or cloudiness, depending upon how recently an individual has taken food. When placed against a clear white background, it can be seen that the basic color of the blood of this species is of rather a faint or delicate yellow. When set aside to clot and crystallize, the dried droplet takes on a deeper yellowish tinge, a highly perceptible glossy appearance, and melanosis has not yet developed in uncovered droplets which have been dried for almost a year. Landois, 1864, saw that fresh and dried blood of the same individual have the same basic color. Poulton, 1885, found that melanosis in insect blood is due to oxidation.

The whole blood of cockroaches consists of plasma and corpuscles. Milne-Edwards, 1835–6, reported that blood consists of water, fibrin, albumin, fatty phosphates, pigments, alkaline salts, cholesterin, urea, etc. To this Landois, 1864, added globulin and metallic iron; Poulton, 1885, found pigments in the blood. He believed that they are not of respiratory nature and stated that when once they gain entrance they need not be renewed, he also found a reducing agent present in insect blood; MacMun, 1886, found myohaematin, the coloring agent of muscular tissue in blood and believed that it has to do with respiration; Griffiths, 1891, among certain of the more common constituents reported iron oxide, calcium, magnesium, soda, phosphoric acid, sulphuric acid, chlorine, oxygen, carbon dioxide and nitrogen. He says that the blood of Lepidoptera is rich in proteids which may separate out and retain much of the oxygen; Cuénot, 1896, believed that albuminoids of blood have respiratory and nutrient functions; Deegener, 1913, lists lutein; Muttkowski, 1923, besides more common substances reported gelatin, fibrinogen, fats, sugars, waste materials, enzymes, copper, potassium, magnesium, uranidine, iodine, lead and arsenic, the two latter regarded as accumulative. Griffiths, 1891, and Muttkowski, 1921, believe that copper in the blood of invertebrates acts as does iron in the blood of higher animals, the copper forming the nucleus of a respiratory protein, haemocyanin, as does iron in haemoglobin. Rollet, 1861, Lankester, 1867, MacMun, 1886, Cuénot, 1891, Griffiths, 1891, Berlese, 1909, and Vaney in larval *Gastrophilus*, Muttkowski, 1920–1, and Hungerford, 1922, report the presence of respiratory proteins in insects. I have seen crystals in especially prepared cockroach blood droplets which suggested those of hematin.

In making a spectroscopic examination of dried whole blood of the cockroach, Dr. Papish found that it contains iron, magnesium and sodium in relatively large quantities (as main constituents), calcium as a trace, aluminum as a small trace; potassium, titanium, copper and zinc in very faint traces (see Fig. 12).

In making a biochemical examination of fresh whole blood of the cockroach Dr. Bodansky found proteins in profuse abundance, especially fibrin; serum globulin and serum albumin are present to a marked degree; sugar from .10 to .12 per cent.; chlorides profuse; calcium oxalate a small amount; urea and uric acid doubtless present, but the available amount of blood too scanty to work out the percentages. Later the writer demonstrated the presence of a catalytic agent in the blood of the cockroach.

Landois, 1864, working with fourteen species of insects decided that each species of insect has its peculiarly characteristic blood crystals. He regards them as being of organic nature and of both plasmal and corpuscular origin. Several kinds of crystals occur in an ordinarily desiccated cockroach blood coagulum. They are of various sizes and shapes, commonly of from six to fifty micra long, although some have been seen which were as many as one hundred sixty-four micra in length and almost as wide. It seems that among them are many sodium urate, uric acid, lysine and calcium carbonate crystals (Fig. 9). Like Landois, 1864, the investigator believes that blood crystals originate in blood corpuscles and from the plasma. In the dried droplet they are far more numerous than are the corpuscles, and of rather uniform distribution throughout the dried mass. If they originate only from the blood corpuscles, it would seem that they would be of more restricted or localized distribution in the droplet, that is, seemingly they would occur more or less grouped about each individual corpuscle. The exact nature of blood crystals has not been learned. Landois, 1864, believed that they are of organic nature, while Graber regarded them as being of inorganic nature. Glaser, 1916–7, agrees with Landois, for he says that they are of protein nature. In the small amount of blood which could be obtained from this species of cockroach, it was impossible to separate the plasma from the corpuscles before coagulation had set in. Blood crystals do not appear until after coagulation and drying to hardness, and I like Landois have seen them in especially prepared, stained ruptured corpuscles. They are regarded as being at least partly of organic origin. The following is the caption to Fig. 9:

A, measured from 17.1 to 22.8 microns, average 19.09 microns, of very slight yellowish green color, rather common in the microscopic field; probably sodium urate crystals.

B, measured from 20.8 to 37 microns, average 28.96 microns; of very yellow color, rather common; probably uric acid crystals.

C, measured from 47 to 164.5 microns, average 96.98 microns, of translucent yellowish tinge, rather common; may be lysine.

D, measured from 13.2 to 19.2 microns, average 16.48 microns; rather delicate appearing, often difficult to discern, rather common; probably calcium carbonate.

E, measured from 8.5 to 14.25 microns, average 11.10 microns; rather common, delicate appearing, suggestive of calcium carbonate.

F, measured from 6 to 16 microns, average 10 microns; very delicate, most common of all crystals; often difficult to see unless focus and illumination are exactly right. Thus far I have been unable to identify these crystals.

In their normal living state the tissues of the cockroach are moist, this moisture being due to a serum which doubtless is a blood plasma derivative. Of the cockroach it gives a faintly alkaline reaction with neutral litmus. Due to this tissue serum it is difficult to learn the exact blood volume of an insect. Usually the bodies (muscles and other tissues) of younger, normally growing or developing individuals contain more water in proportion to their weight than do those of adult individuals of the same species. The results of Bodine's experiments with grasshoppers and those of Babcock with clothes and bee-moth larvae and adults agree with mine. The blood mostly consists of water. Just how much of the body moisture is serum in the tissues or what amount is plasma (in the blood stream) never has been satisfactorily settled for insects.

Edwards, 1835–6, saw that the proportion of plasma to formed bodies varies greatly in individuals of the same species; Newport, 1845, Miall and Denny, 1886, Bruntz, 1908, and Muttkowski, 1923, state that blood quantity varies according to the nutrition status of the individual. Cockroaches which were completely starved for several days and those which had lost much metabolic water were difficult to bleed, due to the scarcity of blood plasma. Of a well fed female from the natural habitat there was much more blood which was easily obtainable and it contained about twice as many corpuscles per unit volume as did that of some which were completely starved for twenty-four hours in the same habitat where the temperature was 22.5 degrees C. or 72.5 degrees F. and the relative humidity was 91.2 per cent. According to the foregoing it seems that the number of corpuscles in the blood lessens with starvation prolongation.

Bowerbank, 1834, in Ephemerids, Newport, 1845, in caterpillars (none in adults), Moseley, 1871, in *Blatta orientalis* (male figured), Deegener, 1913, Tillyard, 1917, and Muttkowski, 1924, record having seen oat- or spindle-shaped corpuscles in the blood of various insects with which they worked. If a form is sufficiently transparent that the blood can be observed as it courses along in the body, it does not seem out of the ordinary that the corpuscles (which normally are quite flexible) change shape or contour as they crowd into interstices among the tissues or the cells thereof. Bowerbank, 1834, states that the spindle- or oat-shaped corpuscles become globular or spherical upon exposure to air.

Edwards, 1835–6, and Landois, 1864, believed that the blood corpuscle forms vary among different species of animals, but at all times appear to be essentially the same for postembryonic individuals of the same species. Prevost and Dumas state that the form and the volume of blood corpuscles are species specificities. Griffiths, 1892, stated that the sizes of blood corpuscles vary in the same individual.

Edwards, 1835–6, saw that the blood corpuscles of invertebrates are of very irregular form, surfaces rugose and readily change shape.

Now it is believed that but two classes of formed objects occur in the blood of insects; foreign bodies, such as parasites, bacteria, etc.; and blood corpuscles and their derivatives.

Usually there are but few kinds of corpuscles found in the blood of insects. Karawaiew, 1898, saw but large and small amebocytes, Bruntz, 1908, in Thysanura found four, Berlese working chiefly with muscids found four or five, Cuénot, 1895, working with Orthoptera reported four, Hollande, 1911, working with Coleoptera, Lepidoptera, Hemiptera, Hymenoptera, etc. found but three, Tillyard, 1917, working with Odonata found but two, and Muttkowski, 1924, working with several different kinds of insects distinguished but two kinds. Most of the foregoing investigators believe that these so-called different kinds of corpuscles are but successive phases in the development of a single corpuscle, but as Cuénot, 1896, stated, the life-history of an amebocyte is difficult if not impossible to trace.

In order to better differentiate among the blood corpuscles of cockroaches it was necessary to modify certain blood stains. Giemsa's, Hasting's and Wright's were tried. Each of the two former should be freshly prepared just before use, for they deteriorate upon standing. Wright's stain gave most satisfactory results when the blood smear was air dried and then treated with five drops of the undiluted stain for thirty seconds, being sure that the stain is spread over the smear. To this then was added as much distilled water as the slide would hold, permitting this to flood the slide for five minutes. Then the smear was thoroughly washed by moving it up and down and sidewise in a beaker of distilled water, or it was thoroughly drenched with a jet of distilled water from an ordinary pipette. With a piece of blotting paper the smear was dried and then was placed upon a radiator to become perfectly dry. Next the smear was mounted in neutral Canada balsam. This method gave results which were fully as satisfactory as any, the process was the least troublesome or involved of the lot, and if kept away from direct light in tightly stoppered bottles, Wright's stain kept well for over a year.

In general appearance and behavior the blood corpuscles of the cockroach, Figs. 10 and 11, most correspond to the leucocytes of higher animals. Among them, in these investigations differentiations have been made with regard to size, proportional size relationships of the nuclei to those of entire cells, a comparison of staining affinities or intensities of the nuclei to those of the general cytoplasm, and the extent to which the nucleus and the cytoplasm was vacuolated.

According to the differentiation criteria as above set forth, it seems that there are several stages through which the corpuscles normally pass from the most recently divided to the farthest depleted condition, but these stages are not so easily separated as at first it may appear, for the phases gradually merge one into the other. A corpuscle in any stage may be more or less spent or vacuolated, but usually the vacuolations are more pronounced in the larger or older corpuscles.

Stage 1, Fig. 11, cytoplasm mediumly dense, rather heavily stained; nucleus rather heavily stained, rather large as compared to the cytoplasmic bulk, granules coarse, nucleus may or may not be in the center of the cytoplasmic mass. Usually the vacuoles of the cytoplasmic and nuclear masses were comparatively few and small. The most active and the most numerous of all corpuscles observed. Nuclear and general cell limits are as set forth in table No. 8. In a count of five hundred corpuscles made at random in an ordinary thin blood smear, three hundred seventeen were of this type. Fig. 1a of Fig. 11 shows one of these corpuscles in the division process; in the above count but two cells were seen thus engaged.

Stage No. 2, Fig. 11, seems to be a corpuscle of stage 1a after division. In it the nucleus is rather large as compared to the cytoplasmic mass, the cytoplasm showing as a narrow periphery around the nucleus. Usually the nucleus and the cytoplasm are rather densely stained, although the cytoplasm always is the fainter colored and sometimes may be but little apparent. The nucleus stains very heavily and its granules are large. These cells appeared to be rather active in the dark field. The nuclear and general cell limits are as given in table No. 8. In a count of five hundred corpuscles made at random in an ordinary thin blood smear, one hundred fifty were of this type.

Stage No. 3, Fig. 11, shows the appearance of corpuscles in the largest and last stage. The cytoplasm and the nucleus are highly vacuolar, stain but faintly, but usually the nucleus stained the darker. Of a cell in the far depleted or far spent condition, usually the nucleus appeared greatly reduced in comparison to the cytoplasmic mass, and the nucleus may or may not be central therein. The limits of size observed are as shown in table No. 8. In a count of five hundred corpuscles which was made at random in an ordinary thin blood smear, but eight were found which were of this type.

No. 4 of Fig. 11 shows what may be cockroach blood platelets. The nucleus and the cytoplasm are rather heavily stained, nuclei are regularly or irregularly outlined and may be fragmentary or entire. The sizes are as recorded in table No. 8. In a count of five hundred corpuscles which was made at random in an ordinary thin blood smear but twenty-nine of these forms were recognized. Their dimensions are as shown in table No. 8.

TABLE NO. 8.

	Cell and Nuclear Sizes.	
Stage No. 1.	8 x28.8	9.6
	12.8x16	8 x 9.6
	12.8x28.8	9.6x11.2
	14.4x20.8	9.6
	14.4x22.4	9.6x12.8
	14.4x25.6	9.6x12.8
	16 x17.6	11.2
	16 x19.2	9.6
	16 x19.2	11.2x12.8
	16 x24	9.6
	17.6x22.4	9.6
	18.1x20.8	9.6x11.2
	18 x22.4	9.6
	19.2	9.6x12.8
	19.2x20.8	9.6x12.8
	19.2x28.8	12.8x16
	20.8x22.4	9.6x12.8
	20.8	9.6x11.2
	22.4x28.8	9.5x15
Stage No. 1a.	14.4	9.6
	14.4	9.6
Stage No. 2.	8 x22.4	8 x 9.6
	9.6x14.4	6.4x 9.6
	9.6x20.8	9.6x12.8
	10.2x16	9.6x10.2
	11.2x16	9.6
	11.2x16	9.6x11.2
	12.8	9.6
	12.8x14.4	11.2
	12.8x16	8 x 9.6
	12.8x16	9.6
	12.8x19.2	9.6
	12.8x19.2	9.6
	16 x14	
	16	14
	16 x17.6	9.6
Stage No. 3.	22.4x32	9.6x12.9
	25.6x28.8	9.6
	25.6x32	9.6
	26.2x32	9.6
	32	9.6x12.8
	35.2	9.6x12.8
	38.4x41.6	9.6
Fig. 4.	8 x13.4	9.6
	9.6x12.1	8
	9.9x12.8	obscure
	10.2x 8	8
	11 x11.2	9.6
	11.2	9
	11.2x12.8	obscure
	12.8	9.6

From what has been seen, it is believed that only the more vigorous corpuscles which have reached certain developmental phases divide to give rise to other corpuscles. Immediately or very soon after separating, it seems that the daughter corpuscles undergo a condition in which the nucleus becomes rather large in comparison to the general cytoplasmic mass, for in the resultant cells the nuclei are by far the most conspicuous parts, so filling the cell that the general cytoplasm thereof appears as but a narrow periphery about the nucleus. Apparently this stage is followed by one in which the general cytoplasm proportionally increases in volume, and thus the cell reaches its prime of growth, developmental and functional vigor. After this it may divide and the resultant daughter cells may grow to their prime of developmental and functional vigor, probably repeating the division process as long as they are sufficiently vigorous so to do.

Evidently the division process is a rapid, infrequent one, otherwise it would seem that corpuscles thus behaving would be more numerous in the mounts. Apparently the corpuscles live in their height of developmental and functional vigor for some time, for such by far are the most numerous in the blood.

It appears that gradually each corpuscle grows to maturity and that continuous functioning results in its becoming highly vacuolated, functionally debilitated or incapacitated and finally completely inactive. The writer believes that degeneration parallels the growing and functioning processes of every stage or phase of existence of the blood corpuscles and that up to a certain stage these degeneration processes are as gradual as are those of cell growth, but that when the degeneration processes have advanced to a certain stage, cell decline and wasting away to final disappearance must be greatly accelerated, and that probably on this account the corpuscles in later degeneration stages seldom are seen.

From what has been observed, the writer is convinced that the accompanying diagrams picture the successive phases or stages through which an individual corpuscle from cockroach blood ordinarily and normally passes during its existence.

With regard to blood corpuscle multiplication there are differences of opinion. Landois, 1864, says that they multiply by fission; Wheeler, 1892, states that in post-embryonic insects they numerically increase by mitosis; Cuénot, 1897; Henneguy, 1904; Bruntz, 1908; Hollande, 1911, and Tillyard, 1917, state that they divide both directly and indirectly. During my investigations I have not seen mitosis, although I have rather closely examined several hundred smears.

Landois, 1864, regarded the pseudopods of blood corpuscles as albumin deposits. Crawley, 1909, saw thorn-like pseudopodia upon erythrocytes; Muttkowski, 1924, saw similar ones upon insect blood corpuscles. My investigations have revealed such structures upon the blood corpuscles of *Blattella germanica* Linn., and they are shown in Fig. 10, B and C.

Tillyard, 1917, states that he found but a few hundred blood corpuscles in a naiadal odonate. In the blood of the cockroach they are much more profuse. From an individual which had been starved for twenty-four hours there were about fourteen hundred to the medium-sized droplet. Fifteen of such droplets were available, and upon the foregoing basis, assuming that the droplets were of about the same size, in the fifteen there were about 21,000 corpuscles. Now in bleeding a cockroach probably not more than 50 per cent. of the total blood content can be directly bled out, the remainder being held in the interstices among the flaccid tissues which it bathes, so that by doubling the above number it is assumed that a conservative estimate of about 42,000 corpuscles is reached. A similar droplet was secured from a second individual. In it about 1,600 corpuscles were counted. Sixteen of such droplets were available, giving an approximation of 51,200 corpuscles content, calculated as previously stated. In a droplet from still another individual which had greedily eaten in the natural habitat, 2,480 corpuscles were counted in a single droplet. She yielded twenty of such droplets, which according to the previous calculation methods would give 99,200 corpuscles in her blood. From the foregoing it is seen that there are wide variations in blood corpuscle content in individuals of the same species, and seemingly those which are well nourished and recently have fed have more blood and a greater number of corpuscles in it per unit volume. It is safe to state that at least thousands of corpuscles normally occur in the blood of a cockroach.

From what has been seen the investigator believes that all cockroach blood constituents contribute to coagulum formation, for when favorably exposed for that purpose, the irritated or stimulated corpuscles send out pseudopodia as is shown in A and B of Fig. 10. It long has been known that insect blood clotting in large measure consists of the interlacing and more or less complete fusing of contiguous portions of the pseudopodia which the corpuscles send out. The fibrinogen acts to generate fibrin which clogs the interstices or meshes occurring among the pseudopodia, so that fibrin is a coagulum constituent. Later, seemingly the corpuscles, their pseudopodia and the fibrin contract, and as a result the liquid serum is squeezed from the clot. If the fresh coagulum is completely lifted from the slide, it will be seen that the surface formerly covered by it still is moist. This moisture is due to serum which was squeezed from the contracting clot as it further dried. To the liquid serum the moisture of the coagulum is due, and it is chiefly the liquid serum which evaporates when the coagulum shrinks and dries to hardness. The watery fluid or liquid serum is blood plasma which is devoid of corpuscles, fibrinogen and fibrin, and to it the fluidity of normally circulating blood is due. Ordinarily liquid serum covers the surface of the fresh clot. If ordinarily exposed, after a time this serum dries down to fuse or mat the clot surface. As the latter further dries it hardens, taking on a smooth glazed or glossy appearance. In the thoroughly dried and hardened coagulum the corpuscles have lost their identity and numerous crystals appear throughout the dried mass.

In Ringer's solution of ordinary composition, cardiac action continued for six hours and about eighteen minutes; in a .6 gram sodium chloride solution in which other salts were reduced accordingly, the heart continued functioning for two hours and about thirty minutes. When the solution ordinarily was made up, with the exception of omitting the dextrose, in one case heart action in it was sustained for five hours and about thirty-five minutes; in another case for four hours and about forty minutes.

Doubtless blood dust as extremely minute albumin and fibrin particles was seen in blood by Milne-Edwards, 1835–6; Stokes and Wegefarth, 1897, and Crawley, 1909. Stokes and Wegefarth, 1897, believed that it is of leucocytic origin, Nicholls, 1906, regarded it as of diverse origin and Crawley, 1909, considered it of erythrocyte origin. The investigator has seen it in the blood of cockroaches. There an erythrocyte origin for it is out of the question, and the writer believes that it is derived from the leucocytes in insect blood.

LIPOMICRONS

Gage and Fish, 1921, experimenting with higher animals found that the fat of the diet appears in the blood as a reconverted material, a fat which is reconstructed from its constituents before it has had an opportunity to enter the blood as species fat. With the dark field microscope they saw freely floating micro fat particles which were carried by the blood stream after fat had been included in the diet. They mention that differences in the form of fat curves (constructed from data secured on digestive activity from hour to hour during a twenty-four hour interval) may be expected in different species as well as in the same individual at different times. In horse, dog, cow, etc., they saw that there are waves of fat absorption during the twenty-four hours following the feeding of fat. They showed that if only certain constituents of fat (fatty acids or glycerols) are fed, certain cells of the digestive tract wall supply the remaining constituents which are necessary for fat synthesis, and that as a result micro fat particles (lipomicrons) are liberated into the blood. Drs. Gage and Fish have traced such fat to fat reserves in the body, where it was stored for future use. Bloor, 1916, saw that lipomicrons occur in the blood stream of well nourished starving dogs. Green, 1914, working with the king salmon found that reserve fat is stored in various tissues of the body, and from such fat reserve stations was drawn upon as an energy source for the spawning migration, during which no food is taken. It has been demonstrated that lipomicrons appear in the blood of the German or Croton cockroach, *Blattella germanica* Linn., after fat or either of its constituents has been included in the diet. The curves of Fig. 13 further deal with the appearance of fat in the blood of these insects which were especially fed for the purpose.

When the average temperature and relative humidity were 20.4 degrees C. or 68.7 degrees F. and 87.9 per cent. respectively over a twenty-four hour interval, the height (maximum) of lipomicron appearance was reached in from 19 to 19½ hours; when the average temperature and relative humidity were 23.6 degrees C. or 76.4 degrees F. and 85.5 per cent respectively during a twenty-four hour interval, the maximum of lipomicron appearance in the blood was reached in from 14 to 19 hours. After twenty-two hours and up to forty hours at an average temperature of 22.5 degrees C. or 72.5 degrees F. and a relative humidity of 91.2 per cent., fat digestion was about the same as during the interval before the maximum was reached.

Curves 19–21 inclusive of Fig. 13 are recorded from starving individuals as compared to Nos. 16–18 inclusive, in so far as fat is concerned. Apparently the individuals of the latter group were drawing from the lipomicrons directly from the digestive tract, while those of the former were drawing from the fat reserve storage stations of the body.

TRACHEAE AND SPIRACLES OF COCKROACH.

Nothing especially striking has been revealed in dissections to demonstrate the tracheal system. It may be well to mention that freshly killed specimens were impaled upon a very fine pointed pipette which was made by drawing a piece of small soft glass tubing to a point. The fine point was thrust through the body wall between the first and second pair of legs. Specimens then were inflated by blowing into the larger end of the pipette until the normally concealed genitalia bulged forth, an excellent scheme for revealing such structures in freshly killed specimens. The inflated individual, still impaled upon the fine pipette and under air pressure from the mouth of the operator was held over an electric hotplate until thoroughly dried, known by occasionally releasing the pressure. At such times, if specimens slightly collapsed continued inflation and desiccation were necessary until upon releasing the presure, the specimens remained thoroughly rigid. If thoroughly inflated and dried to the extent as above indicated, the intersegmental membranes are so stretched that any structures which they bear are bulged forth to be clearly revealed if properly examined.

There are ten pairs of spiracles, but unless specimens are especially prepared, all but the last abdominals are difficult to locate. The tracheal system consists of large, parallel tracheal trunks which are conected by cross commissures. Dilatations may occur in the main trunks, in the commissures or directly or indirectly connected with either or both. By some, these dilatations have been mistaken for air sacs, but taenidia are developed in them. It is doubtful that any two tracheal systems are exactly alike; in fact rarely are the two sides of the tracheal system of the same individual exactly symmetrical. Occasionally rather well developed portions in one individual correspond to rather poorly developed portions in others, or parts which are present in one individual may not be represented in another (Figs. 14–20).

In some insects air may be taken into other than the tracheal system, as has been observed in the cockroach. Just previous to the molt specimens have been noticed to bob the front end of the body up and down. In the meantime the body, especially the abdomen, becomes so distended that it loses its flat appearance and becomes more cylindrical. Soon the muscles upon each side of the thoracic terga begin to contract and relax, and at the same time a definite line or crease appears along the middle of the length of the dorsum of each thoracic segment. This continued until the old cuticula finally separated along that line similarly as does a piece of tin which is repeatedly creased and uncreased by folding and unfolding along the same line. The specimen then molted. After the wings had begun to unfold, their tips were snipped and several drops of blood came from them, but comparatively little came from snipped antennal and leg tips. An incision then was made through the dorsal surface near the posterior end of the abdomen. Through this incision an inflated membrane appeared. The projecting portion was stained with alcoholic eosin, and upon dissection it was revealed that it was the crop which was air inflated to the extent that it crowded the remainder of the alimentary tract into the posterior abdominal extreme. Thus via the crop air pressure aided in rupturing the old cuticula and exerted pressure upon the blood which aided in unfolding the elytra and the true wings. In other individuals blood could not be obtained from the wings after the body normally had become flattened and of color characteristic of the adult. If the crop is punctured while the body is in the inflated cylindrical condition, the ruptured structure collapses as does an inflated tire at the time that it is punctured. Knab, 1909–1911, noted a similar function of air in flies and other insects.

SUMMARY AND CONCLUSIONS.

The average percentage of moisture in an adult cockroach from the natural habitat is about 68, and assuming that about one-third of it may be blood, gives about 20 per cent. of the body weight due to its blood content. But this may greatly vary due to the nutrition status of the individual.

The proportion of moisture to body weight is still higher in younger individuals. Doubtless a great portion of the moisture is present in the form of blood plasma and tissue serum, the latter a derivative of the former and practically inseparable from it, so that the amount of blood as such which occurs in the insect body never has been satisfactorily calculated. Temperature and relative humidity influences as well as the nutrition status have their effects upon the moisture content of the body, for well nourished individuals contained more blood than did those which were completely starved for twenty-four hours or longer; and cockroaches which had lost much metabolic water as a result of having been exposed to unfavorable relative humidity and thermal influences yielded blood with as great difficulty as did those which had been completely starved for some time, so that the metabolic water must have been yielded from the blood and probably from the tissues. If the individual is deprived of solid food but has access to sufficient water, it bleeds readily and profusely until it has starved to death.

At lower temperatures cockroaches of this species seek seclusion in places the relative humidity of which is higher; at lower relative humidities they sought seclusion in places the temperatures of which were higher.

Of all Orthoptera, Homoptera, boring larval Lepidoptera, two phytophagous larval Lepidoptera and two Coleoptera, one of the family Cerambycidae, the other of the family Carabidae, the blood reacted alkaline to neutral litmus.

Of all phytophagus Coleoptera, pollen eating Coleoptera, phytophagous and pollen eating Coleoptera, carnivorous Coleoptera and phytophagous larval Lepidoptera but two species, the blood reacted alkaline to neutral litmus.

Of all Diptera which were examined, the blood reacted alkaline to neutral litmus.

The blood of certain phytophagous larval Lepidoptera reacted alkaline, while that of certain others reacted acid to neutral litmus.

The blood of a pollen eating beetle, *Cyllene robiniae* (Cerambycidae) reacted alkaline, while that of others, *Chauliognathus* (Lampyridae) and of *Trirhabda* (Chrysomelidae) reacted acid to neutral litmus.

The blood color of representatives of different families of the same order of insects may differ, although the individuals feed upon the same host species. Among insects blood color never is due to that of the corpuscles, but always is due to that of the plasma.

The blood of certain carnivorous Coleoptera (Coccinellidae) reacts acid, while that of others (Carabidae) reacts alkaline. The blood of the former is of reddish color, while that of the latter is of turbid whitish color.

The blood of adult phytophagous Coleoptera which were examined is of yellow color, while that of phytophagous larval Lepidoptera usually is of greenish color.

Blood color modifications are of little taxonomic importance.

The results of these experiments reveal that influences other than host plant sap act in the coloring of insect blood, for insects of different species feeding upon hosts of the same species have blood which may present color differences and which may be of different color than is that of the host sap or tissues upon which the insects feed; that insects of different species feeding upon hosts of the same species may have blood which reacts differently and that the reaction of blood to neutral litmus usually is different than that of the sap or tissues which serve as food.

Ordinarily larvae bear more blood in proportion to the body weight than do adults.

From the foregoing investigations it is further concluded that the acidity, alkalinity and color of insect blood are species specificities and are influenced by more than just the food which the insect takes.

Ordinarily the constituents of the plasma and those of the corpuscles are difficult to separate by hard and fixed lines, for it seems that some of the constituents of each are interchangeable.

The corpuscles of cockroach blood are not known to be of respiratory character, although very locally the plasma may be concerned with the transportation of respiratory gases.

It is believed that the blood of the cockroach is concerned with the transportation of nourishment as the chief function. This it carries to and among the tissues, removing metabolic wastes from them. It is doubtful that the blood corpuscles carry food to the tissues, at least microparticles of fat profusely and freely occurred in the blood stream.

All individuals did not bleed equally readily, some bled more easily and more profusely from clipped antennae than they did from clipped cerci and vice versa. Some at times bled more profusely and more easily than they did at others.

The basic colors of fresh and of dried cockroach blood are very similar.

According to spectroscopic and biochemic analyses the blood of cockroaches seems to be as complex as is that of other animals.

There are several kinds of crystals in the blood of cockroaches, and it appears that they are of organic nature.

In coagulation it seems that all blood constituents of the cockroach take part, for in the process the corpuscles send out pseudopodia which fuse with those of other corpuscles, and fibrin clogs the interstices among them. The mass later contracts and as a result the serum is squeezed out.

Reflex bleeding is not recorded among cockroaches. Cockroach blood is neither toxic nor repellant to certain kinds of spiders, assassin bugs and other arthropods.

Ringer's solution of .8 per cent. sodium chloride concentration gave best results in sustaining cardiac action, although good results were obtained when a .6 per cent. concentration of sodium chloride solution with reduction of other salts accordingly was used, whether dextrose was or was not included.

Lipomicrons appear in the blood of especially fed cockroaches similarily as do chylomicrons in the blood of higher animals.

Blood dust similar in appearance and behavior to that in higher animals is found in cockroach blood. In insects it is highly probable that it comes from the blood corpuscles.

Peculiarities in the behavior of cockroach blood corpuscles paralleling those which have been seen in the blood of higher animals have been observed.

Wright's stain gave the most satisfactory results of those which were used in working with cockroach blood corpuscles. The process was the least troublesome or involved of the lot, the results were more permanent and the stain kept well for over a year if placed into tightly stoppered bottles which were stored away from direct light.

In behavior, appearance, etc. cockroach blood corpuscles are very similar to the leucocytes of higher animals. It is believed that only the more vigorous corpuscles which have reached certain development phases can divide to give rise to other cerpuscles. Immediately or very soon after separating it seems that the daughter corpuscles undergo a condition in which the nucleus is rather large in comparison to the general cytoplasmic mass, for in the resultant cells the nuclei are by far the most conspicuous parts, so filling the cells that the cytoplasm thereof appears as but a narrow periphery about the nucleus. Apparently this stage is followed by one in which the general cell cytoplasm proportionally increases in volume, and that thus the cell reaches its prime of growth, developmental and functional vigor. After this it may divide and the resultant daughter cells may grow to their prime of developmental and functional vigor, probably repeating the division process as long as they are sufficiently vigorous so to do.

Evidently the division process is a rapid, infrequent one. Apparently the corpuscles live in their height of developmental and functional vigor for some time, for such by far are the most numerous in the blood.

It appears that gradually each corpuscle grows to maturity, and that continuous functioning results in its becoming highly vacuolated, functionally debilitated or incapaciated and finally completely inactive, soon after which it entirely wastes away or disappears. The writer believes that degeneration parallels the growing and functioning processes of every stage in the existence of the blood corpuscles and that up to a certain stage these degeneration processes are as gradual as are those of cell growth, but that when the degeneration processes once reach a certain condition, the cell decline and wasting away to final disappearance must be greatly accelerated, and that probably on this account corpuscles in the later degeneration stages seldom are seen.

From what has been observed, the writer is convinced that the accompanying diagrams, Fig. 9, picture the successive stages through which an individual corpuscle from cockroach blood ordinarily and normally passes during its existence.

There are at least thousands of blood corpuscles in an adult cockroach. It is believed that the total volume of corpuscles as compared to that of the blood plasma varies in the same individual from time to time and that one individual may contain more blood than does another. It is believed that the nutrition status of the individuals influences the amount of blood which that individual contains.

If the temperature is too low in the cockroach, fat digestion may be arrested, although fat is present in the crop.

In well-nourished, starving cockroaches it seems that fat is withdrawn from fat reserve stations of the body.

In my experiments fat has been demonstrated only in the free state (as lipomicrons) in the blood stream.

Somewhat as in higher animals, waves of fat digestion occur in the Croton or German cockroach, *Blattella germanica* Linn.

Differences in the forms of curves may be expected in individuals of the same species, although they are subjected to identical thermal and relative humidity influences.

Ordinarily in the cockroach the time of maximum appearance of fat in the blood in a rough or general way approximates that of certain higher animals.

If fatty acids or glycerol alone are fed, the tissues of the digestive tract wall supply the necessary constituents (fatty acids or glycerols) to synthesize species fat. It appears that fat digestion in this insect is as much of an involved process as is that in a higher animal.

These researches tend to indicate that the blood of insects is as highly complex a tissue as is that of the higher animals.

Nothing particularly striking has been revealed in dissections which were made to demonstrate the tracheal system in its grosser aspects. There are ten pairs of spiracles. Certain tracheal dilatations have been mistaken for air sacs, but taenidia are developed in them. Usually the two sides of the tracheal system of the same individual are not exactly symmetrical. Occasionally rather well developed portions in one individual correspond to rather poorly developed parts in others, or parts which are present in one individual may not be represented in another. Air pressure brought about by a fully distended or inflated crop aids in making the molt in cockroaches, and it is believed that this exerts a pressure upon the blood in unfolding the elytra and true wings at the time of the final molt.

From the main tracheal trunks smaller branches are given off, these still more finely divide, and so on down to the finest or most minute. These latter are reduced to microscopic capillarity (less than a micron in diameter). So a portion of a tracheal trunk showing all attached derivative branchings to the most minute extremes presents a dendritic arrangement, the minutest extremities of which are so fine and so numerous that but few if any of the cells of the tissues which are aerated by the portion under consideration are not reached or permeated by them.

CAPTION TO FIGURES.

Figs. 1–3. Cockroach trap, showing method of making the trapping cone and placing it within a trapping receptacle, Fig. 1. In such a trap decoys of the species to be trapped are used; so are attractive baits. This type of trap catches cockroaches without injury; only uninjured individuals were used in these investigations.

Fig. 4. Type of bottle cage in which uninjured experimental material was kept during the investigations. The cork is perforated and the lower end of the perforation is screened with a fine meshed brass screen. A bit of dampened sponge is kept in the perforation so that the air in the cage is kept moist, as indicated by condensation upon the walls of the cage. A piece of pasteboard was cut sufficiently wide so that it just easily passed into the mouth of the bottle. Its length was slightly greater than the inside diameter of the cage. Upon introducing it into the cage, it was placed with the free ends directly downward and as it straightened out until the ends reached the walls it formed a shelter beneath which the specimens spent much of their time. Food was placed into the bottle as frequently as the specimens needed it.

Fig. 5. Temperature and relative humidity control tube the use of which has been explained in the text.

Fig. 6. Individual housing vial wherein the temperature and relative humidity were kept constant during experimentation.

Fig. 7. Individual housing vials arranged in a constant temperature oven the heat of which was supplied by a 60 watt bulb, the humidity was kept constant by a vat of water, W; the bit of water saturated sponge in the perforated cork of the individual housing vial and by the water in the vial, shown by 5 beneath the glass plate 4 of the vial. .

Fig. 8. Demonstrates my method of making blood smears so that the blood corpuscles are little if at all injured in the process.

Fig. 9. Demonstrates different types of blood crystals of cockroach blood.

Fig. 10. Cockroach blood corpuscles in action in a fresh blood smear.

Fig. 11. Different types of cockroach blood corpuscles.

Fig. 12. Photograph of the spectrum which was produced as dried cockroach blood was burned in investigating the mineral contents thereof.

Fig. 13. Shows the curves which were obtained by recording the numbers of lipomicrons which were present at various time intervals after the experimental individuals had been fed fat. The numbers at the ends of the curves indicate the individual concerned in obtaining the data; the figures on the horizontals are time interval notations, recorded by the hour and by the half hour.

Fig. 14. Spiracular distribution upon the cockroach body.

Fig. 15. Dorsal position of the first pair of abdominal spiracles.

Fig. 17 (and that above). Lateral views of the tracheal system of a cockroach, *Blattella germanica* Linn.

Fig. 18. One of a dorsal tracheal arrangement of an individual *Blattella germanica* Linn.

Fig. 19. One of a ventral tracheal arrangement of an individual *Blattella germanica* Linn.

Fig. 20. Scheme of tracheal arrangement in a cross section taken through the spiracle region of one of the abdominal segments.

BIBLIOGRAPHY.

About 700 articles have come to my attention since I have been working on this problem. To publish all in a bibliography is not considered necessary. The following list includes only those which have a more important bearing upon the subject.

Agassiz, L., 1849. On the Circulation of the Fluids in Insects. Proc. Amer. Assoc. for the Advancement of Science, 2nd Meeting, 1849: 140–143.

Alexander, Chas. P., 1919. The Crane-flies of New York, Pt. 1, Distribution and Taxonomy. Mem. No. 25, Cornell Univ. Agr. Expt. Sta., June, 1919.

——, Same, Pt. 2, Biology and Phylogeny. Mem. No. 38, same, June, 1920.

Babcock, S. M., 1912. Metabolic Water, Its Production and Role in Vital Phenomena. Resch. Bl. No. 22, Univ. of Wisconsin Agr. Expt. Sta., 87–181.

Bodine, Jos. H., 1893–1921. Factors Influencing Water Content and Rate of Metabolism of Certain Orthoptera. Jour. of Exp. Zool., Vol. 32, No. 1, 137–164.

Bowerbank, J. S., 1833. Observations on the Circulation of the Blood in Insects. Entomological Magazine, Vol. 1: 239–244; also see same in Muller's Arch. f. Physiol., Bd. 1, 1834: 119–120.

Bruntz, L., 1908. Nouvelles récherches sur l'excretion et la phagocytose chez les Thysanoures. Ebenda t. 8 (4). Aussi vide Archives de Zoologie expérimentale et générale. IVe Ser., t. VIII: 471–488.

——, 1908. Note sur l'anatomie et la physiologie des Thysanoures. Bl. des séances de la Société des Sciences de Nancy. Extrait.

——, Sur la structure et le réseau trachéen des canaux excréteurs des reins de *Machilis maritima* Leach. Bl. des séances de la Société des Sciénces de Nancy. Aussi vide C. R. Acad. Sci. Paris, t. 146.

——, 1909. Sur l'existence d'organes globuligènes chez les Cumacés. Arch. de Zool. expt. et gen. (4), Vol. 9. Note et revue: 65–69.

Burke, H. E., Hartman, R. D., and **Snyder, T. E.**, 1922. The Lead Cable Borer, or the Short Circuit Beetle in California. U. S. D. A. Bl. 1007.

Burmeister, H., 1832. Handbuch der Entomologie, 1, 169–194 und 416–436.

Burnett, S. H., 1917. Clinical Pathology of the Blood of Domesticated Animals. Text, 156 pp. W. F. Humphrey Press, Geneva, N. Y.

Chapman, R. N., 1918. The Basal Connections of the Tracheae of the Wings of Insects. In Prof. Comstock's "The Wings of Insects": 27–51.

Church, A. H., 1869. Researches on Turacin, an Animal Pigment Containing Copper. Roy. Soc. London Proc., 1868–1869, abs.: 436.

——, 1892. An Animal Pigment Containing Copper. Proc. Roy. Soc. London, Apr.

Comstock, J. H., 1909. A Manual for the Study of Insects: 73–76 and 67–72.

——, 1918. The Wings of Insects: 12–51, 110–117 and 123–131.

——, 1920. An Introduction to Entomology: 113–120 and 121–123.

Comstock, J. H., and **Kellogg, V. L.**, 1918. The Elements of Insect Anatomy, 10th Edit.: 1–145.

Crawley, Howard, 1909. Studies on Blood and Blood Parasites. U. S. D. A. Bur. Animal Ind. Bl. 119. Observations on Mammalian Blood with Dark Field Illumination: 5–115.

Cuénot, L., 1896. Études sur le sang et les glandes lymphatiques dans la série animale. Insèctes. Arch. Zool. Exper., 2, IX: 365–399. Also see summary of same in Jour. Roy. Mic. Soc.: 192.

——, 1897. La saignée réflexe chez les Insectes. Mem. Soc. Anat. Alz. X: 39–48.

——, 1899. Les prétendues organes phagocytaires décrits par Koulvetch chez la blatte. Arch. Zool. Exper. (3) 7, Nat. Rev. No. 1: 1–2.

Deegener, P., 1913. Zirkulationsorgane und Liebeshöle. Schröder's Handbuch der Entomologie. Dritte Lieferung, Kapitel 6: 383–430.

Dusham, E. H., 1914. A Method of Injecting the Trachea of Insects. Ent. News, Vol. 25: 468, Dec., 1914.

Edwards, H. Milne, 1835–36. Blood. Todd's Cyclopaedia of Anatomy and Physiology, Vol. 1: 405–415.

Folsom, J. W., 1922. Entomology with Special Reference to Its Biologic and Economic Aspects. Text, 3rd Edit. Blakiston, Maple Press, York, Pa.: 109–112, 116–123.

Gage, S. H., 1920. The Microscope. Text. 13th Edit. Comstock Pub. Co., Ithaca, N. Y.: 37–76k and 312–323.

Gage, S. H., and **Fish, P. A.**, 1921. The Presence of Microparticles in the Blood and Other Body Fluids. Jour. of Amer. Vet. Med. Assoc., Jan. '21, Vol. 58, No. 4: 348–402.

——, 1921. The Ultraparticles of the Blood and Chyle. Cornell Veterinarian, Apr., 1921.

Geyer, K., 1913. Untersuchungen über die chemische Zusammensetzung der Insektenhaemolymphe und ihre Bedeutung für die geschechtliche Differenzierung. Zeitschr. f. w. Zoologie: 349–499.

Glaser, R. W., 1916. Growth of Insect Blood Cells in Vitro. Psyche, 24: 1–7.

Greene, C. W., 1914. The Storage of Fat in the Muscular Tissues of the King Salmon and Its Resorption During the Fast of the Spawning Migration. Bur. of Fisheries Doc. No. 799, Sept. 30, '14: 73–138.

——, 1914. The Fat Absorbing Function of the Alimentary Tract of the King Salmon. Bur. of Fisheries Doc. No. 802, Oct. 28, '14: 153–175.

Griffiths, A. B., 1891. 1. On Blood of the Invertebrata. Proc. of the Roy. Soc. of Edinburgh, Vol. 18: 288–294.

——, 1892. 2. On the Blood of Invertebrates. Proc. of the Roy. Soc. of Edinburgh, Vol. 19: 116–130.

——, 1892. Sur la composition de la chlorocrurorin. C. R. Acad. des Sci., Vol. 114: 1277–1278.

——, 1892. Sur la composition de l'haemocyanin. C. R. de l'Acad. des Sci., t. 114: 496.

——, 1892. Sur la composition dé la pinnaglobin, une nouvelle globulin. C. R. Acad. des Sci., t. 114: 840.

Hallez, P., 1909. Les cristaux de la Blatte. Paris, C. R. Acad. des Sci., 148: 317–318.

Hawk, P. B., 1916. Practical Physiological Chemistry. Text. Blakiston, 5th Edit.

Haycroft, H. B., and **Carlier, E. W.**, 1888. On Invertebrate Blood Removed from Vessels and Entirely surrounded by Oil. Proc. of the Roy. Soc. of Edinburgh, Vol. 15: 423–426.

Headlee, T. J., 1916–17. Atmospheric Moisture and Insect Metabolism. N. J. Agr. Expt. Sta. Rept.

——, 1917. Some Facts Relative to the Influence of Atmospheric Humidity on Insect Metabolism. Jour. of Econ. Ent., Vol. 10, No. 1, Feb.: 31–38.

Hénnéguy, L. F., 1904. Les Insectes. Texte: 82–87, 98–108 et 612–621.

Hollande, A. Ch., 1907. Contribution a l'étude du sang des Coléoptères. Arch. de Zool. Expt. et Gen., Paris, Ser. 5, t. 2: 271–294.

——, 1911. Étude histologique comparée du sang des insectes à hemorrhées et des insectes sans hemorrhées. Arch. Zool. Paris, Ser. 5, 6: 283–323.

——, 1912. L'autohemorrhée ou le rejet de sang par les insectes. Arch. Anat. microsc., Paris, 13: 171–318.

Houlbert, C., 1920. Les Insectes. Texte.: 112–131.

Hungerford, H. B., 1922. Oxyhemoglobin Present in the Backswimmer, *Buenoa margaritacea* Bueno. Canad. Ent. Nov. '22: 262–263.

Kellicott, W. E., 1913. Outlines of Chordate Development. Henry Holt Co., N. Y.

Kingsley, J. S., 1917. Outlines of Comparative Anatomy of the Vertebrates. Blakiston, 1012 Walnut St., Phila., Pa.

Knab, Frederick, 1909. The Role of Air in the Ecdysis of Insects. Proc. of the Ent. Soc. of Washington, 11: 68–73.

——, 1911. Ecdysis in the Diptera. Proc. of the Ent. Soc. of Washington: 13: 32–42.

Landois, H., 1864. Beobachtungen über das Blut der Insekten. Zeitschr. f. wiss. Zool., XIV: 54–70.

Lewis, F. T., and **Stöhr, P.**, 1917. Textbook of Histology, Blood, etc.: 163–215.

Lübben, H., 1907. Blutkörperchen in ihrer Rolle als Phagocyten, speziell bei der Metamorphose der Insekten. Natur und Haus, 3515, Stuttgart, 16: 29–31 und 36–37.

McIndoo, N. E., 1916. The Reflex Bleeding of the Coccinellid Beetle, *Epilachna borealis*. Annals of the Ent. Soc. of America, Vol. 9: 201–203.

Macmunn, C. A., 1886. Researches on Myohaematin and the Histohaematins. Proc. of the Roy. Soc. of London, Vol. 39: 248–252.

Miall, L. C., and **Denny, Alf.**, 1886. The Structure and the Life-history of the Cockroach, *Blatta orientalis* Linn. A Book: 133–166.

Moseley, H. N., 1871. On Circulation in the Wings of *Blatta orientalis* and Other Insects and a New Method of Injecting Vessels of Insects. Quar. Jour. Mic. Sci., Vol. 11, n. s.; 389–395.

Muttkowski, R. A., 1920. The Respiration of Aquatic Insects; A Collective Review. Bl. of the Brooklyn Ent. Soc. 15: 89–96 and 131–140.

——, 1921. Copper, Its Occurrence and Role in Insects and Other Animals. Trans. of the Amer. Mic. Soc., Vol. 40, No. 3: 144–157.

——, 1921. Copper in Animals and Plants. Sci., n. s. 53, No. 1376: 453–454.

——, 1921. Studies on the Respiration of Insects. I. The Gases and Respiratory Proteins of Insect Blood. Annals of the Ent. Soc. of America, 14: 150–156.

——, 1923. Studies on the Blood of Insects. II. Bl. of Brooklyn Ent. Soc., Vol. 18, No. 4, Oct. '23: 127.

——, 1924. Studies on the Blood of Insects. Bl. of Brooklyn Ent. Soc., Vol. 19, Feb. '24: 4–19.

Newport, Geo., 1837. On the Temperature of Insects and Its Connection with the Functions of Respiration and Circulation, etc. Philosoph. Transacts.: 259–338.

——, 1839. Insects. Todd's Cyclopaedia of Anatomy and Physiology, Vol. 2: 329–439 and 853–994.

——, 1845. On the Structure and Development of the Blood. First Series, The Development of Blood Corpuscles in Insects and Other Invertebrates and Its Comparison with That of Man and Other Vertebrates. Ann. Mag. Nat. Hist. Ser. 3, t. 3.

Nicholls, A. G., 1906. On the Nature and the Significance of the So-called "Dust Bodies" of the Blood. Proc. and Transacts. of the Roy. Soc. of Canada, Ottawa. 2s, Vol. 11, Tr. Sect. 4: 3–19.

Packard, A. S., 1898. A Textbook of Entomology. The Organs of Circulation: 397–412; The Blood Tissue: 419–429; and the Respiratory System: 430–484.

Parker, T. J., and **Haswell, W. A.**, 1921. Textbook of Zoology, Vol. 2: 235.

Poulton, E. B., 1885. 1. The Essential Nature of the Coloring of Phytophagous Larvae and Their Pupae, with an Account of Some Experiments upon Relation Between Color of Such Larvae and That of Their Food Plants. Proc. of the Roy. Soc. of London, Vol. 38: 269–315.

Rich, A. R., 1920. An Ultramicroscopic Study of the Two Stages of Blood Coagulation. Sci., n. s. Vol. 52, No. 1332, July 9: 38–41.

Sanford, E. W., 1918. Experiments on the Physiology of Fat Digestion in Blattidae. Jour. of Expt. Zool., Vol. 25: 355–412.

Schleip, Karl, 1908. Atlas of Haematology. Adapted to English by Frederic E. Sondern: 3–6, 17–20, 35–54 and 91–92.

Science Service, 1923. Race Horse Endurance and Red Blood Cells. Sci., n. s. Vol. 57, No. 1484, Fri., June 8, News Section.

Shafer, Geo. D., 1911. How Contact Insecticides Kill. Tech. Bl. of Mich. Agr. Coll. Expt. Sta. No. 11: 8–15.

——, 1923. The Growth of Dragon-fly Nymphs at the Molt and Between Molts. Stanford Univ. Publications. Univ. Series of Biol. Sciences, Vol. 3, No. 4.

Stokes and **Wegefarth,** 1897. The Presence in the Blood of Free Granules Derived from Leucocytes, etc. Bl. Johns Hopkins Hospital, 8: 246.

Thallheimer, Wm., and **Perry, Margaret,** 1923. Effects of Plant Extracts on Blood Sugar. Sci., Vol. 58, No. 1494, Aug. 17: 120–121.

Tillyard, R. J., 1917. The Biology of Dragon-flies. Camb. Univ. Press: 163–164.

Wheeler, W. M., 1892. Concerning the Blood Tissue of Insects. Psyche VI: 216–220, 233–236 and 253–258.

Wielowiejski, H. von, 1886. Ueber das Blutgewebe der Insekten. Eine vorlaufe Mitteilung. Zeitschr. f. w. Zool., Bd. XLIII: 512–536. A brief summary in Jour. Roy. Mic. Soc., 2, VI: 964.

Wooldridge, L. C., 1884. On a New Constituent of the Blood and Its Physiological Import. Roy. Soc. Proc., Vol. 38: 69–72.

——, 1884. On the Origin of Fibrin Ferment. Roy. Soc. Proc., Vol. 36: 417–420.

——, 1885. On Fibrin Yielding Constituents of Blood Plasma. Roy. Soc. Proc., Vol. 38: 260–264.

Wright, J. H., 1916. The Histogenesis of the Blood Platelets. Jour. of Morphol., 21: 263.

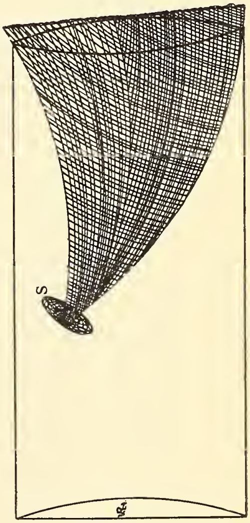


Fig. 1.

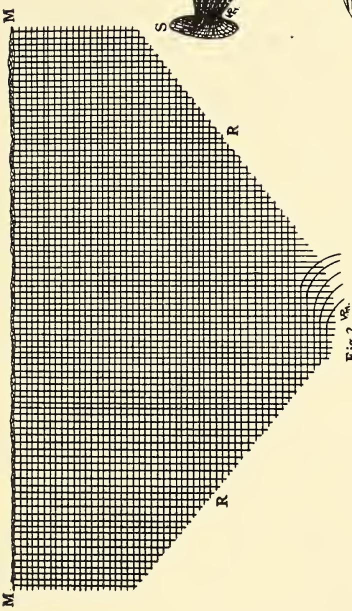


Fig. 2.

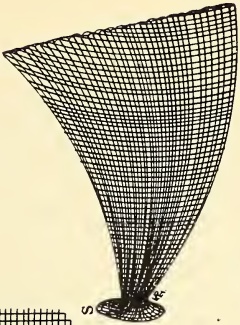


Fig. 3.

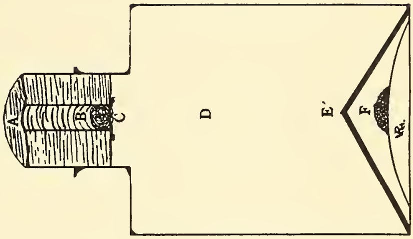


Fig. 4.

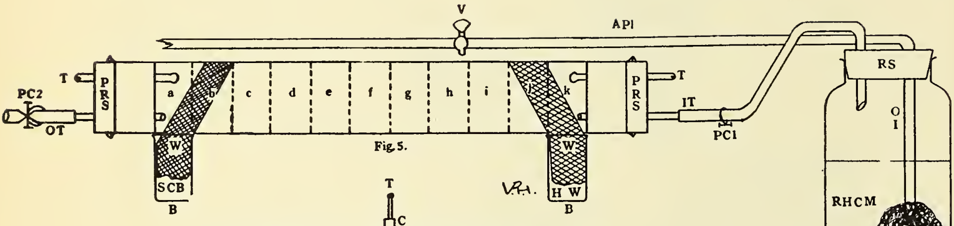

V
APl
T
PRS
a
b
c
d
e
f
g
h
i
j
k
PRS
T
PC2
OT
IT
PC1
RS
O
I
W
SCB
B
W
HW
B
RHCM
GC
VH

Fig. 5.

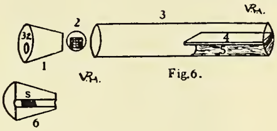

32
1
2
3
4
s
6
VH

Fig. 6.

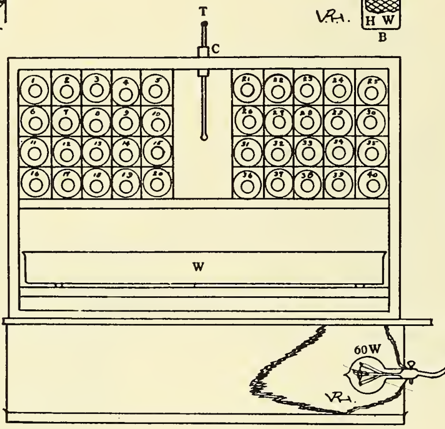

T
C
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
W
60W
VH

Fig. 7.

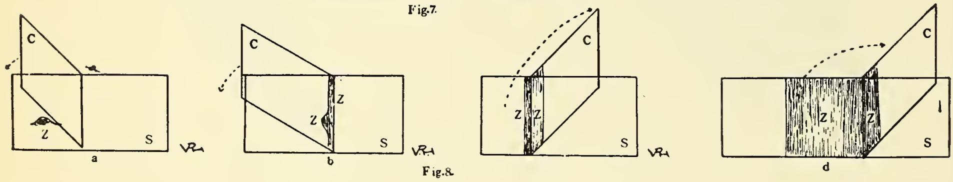

C
Z
S
VH
a
C
Z
Z
S
VH
b
C
Z
Z
S
VH
C
Z
Z
S
d

Fig. 8.

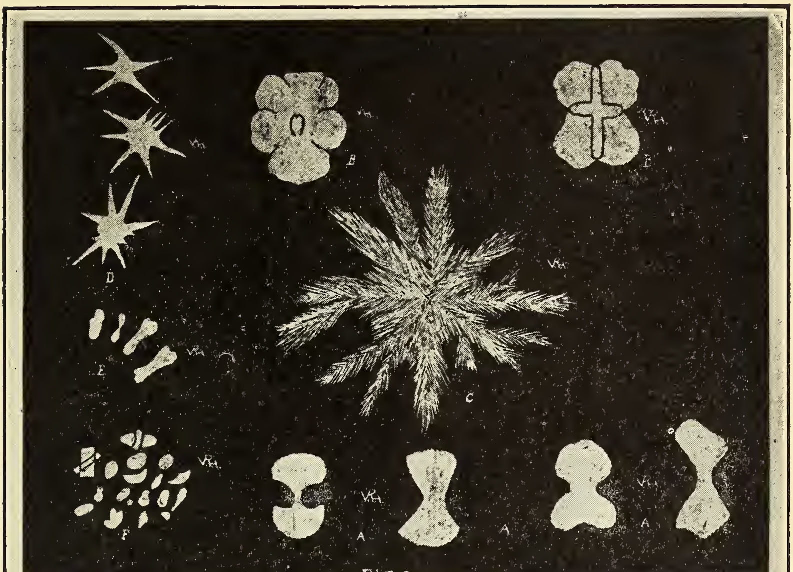

D
B
E
E
C
F
A
A
A
VRH

Fig. 9.

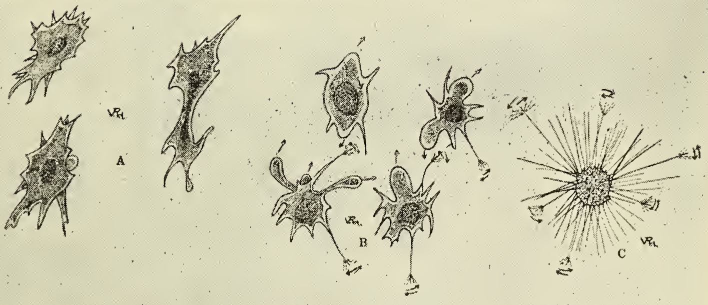


Fig. 10.

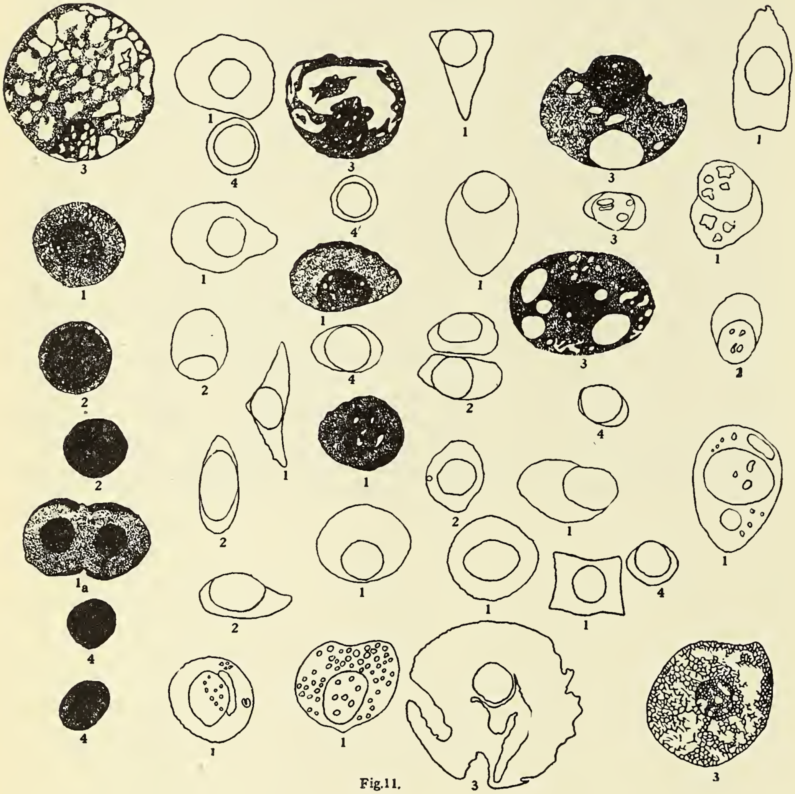

3
1
4
3
1
3
1
4'
3
1
1
1
1
1
2
2
4
2
1
2
3
2
2
1
4
2
2
1
2
1
1a
2
1
1
1
1
4
4
2
4
1
1
3
3

Fig.11.

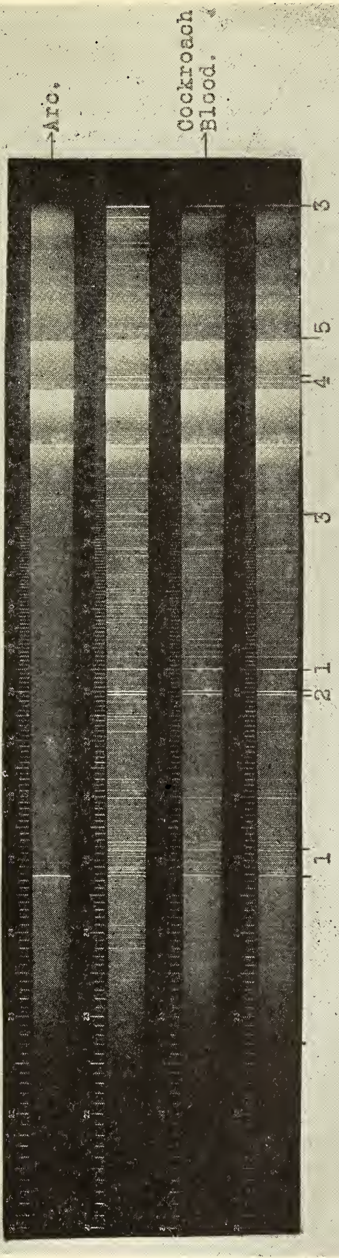


Fig. 12.

1. Iron.
2. Magnesium.
3. Sodium.
4. Aluminum.
5. Calcium.

Potassium, titanium, copper and zinc in very faint traces.

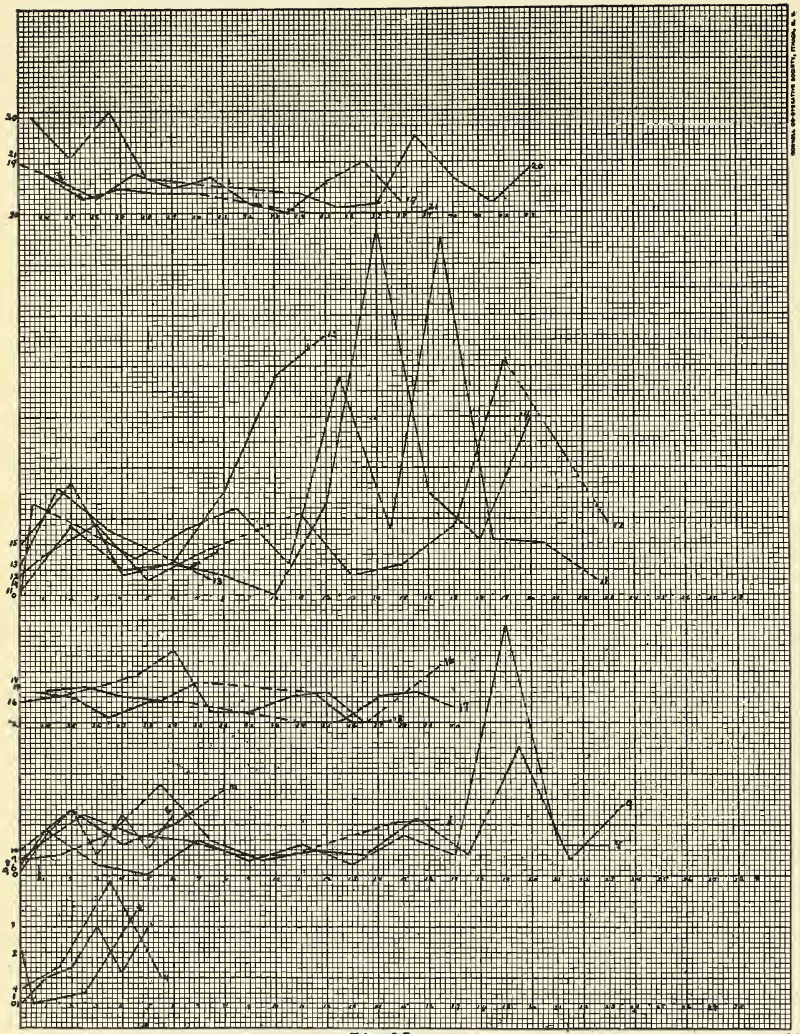

CORNELL CO-OPERATIVE SOCIETY, ITHACA, N.Y.
20
19
17
21
13
12
14
15
18
16
9
8

Fig. 13.

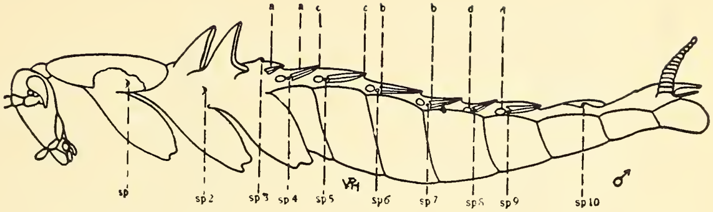

a
a
c
c
b
b
d
d
sp
sp2
sp3
sp4
sp5
sp6
sp7
sp8
sp9
sp10
♂

Fig. 14.

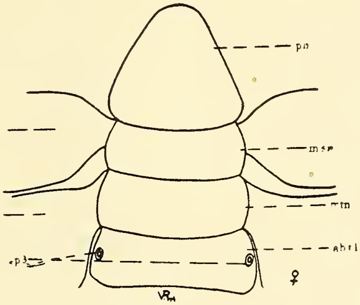
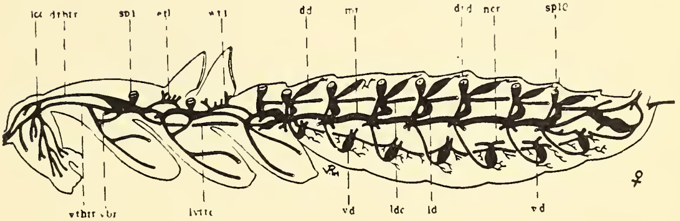

pn
msn
mtn
abt1
sp3
♀

Fig. 15.


lcc
dthtr
sp1
etl
wtl
dd
mt
dtd
ncr
sp10
vthtr
vbr
lvttc
vd
ldc
ld
vd
♀

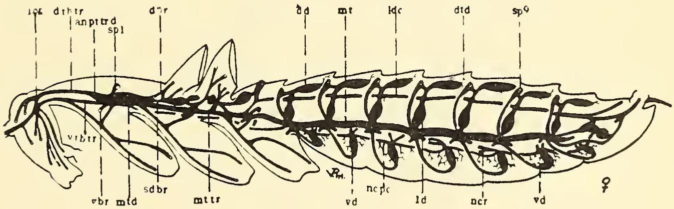

lcc
dthtr
anpttrd
sp1
dbr
dd
mt
ldc
dtd
sp9
vtbtr
vbr
mtd
sdbr
mttr
vd
ncpc
ld
ncr
vd
♀

Fig. 17

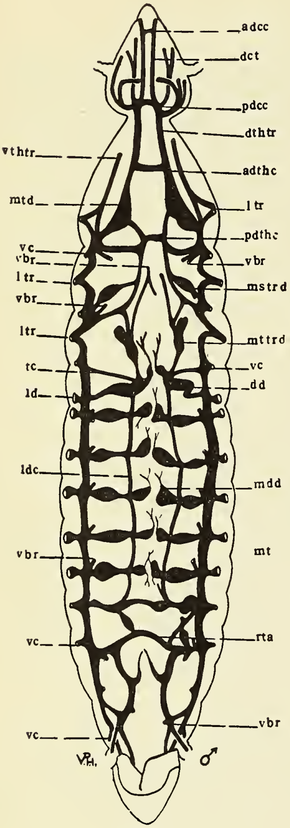

adcc
dct
pdcc
dthtr
vthtr
adthc
mtd
ltr
pdthc
vc
vbr
vbr
ltr
mstrd
vbr
ltr
mttrd
tc
vc
ld
dd
ldc
mdd
vbr
mt
vc
rta
vc
vbr
V.P.H.
♂

Fig. 18.

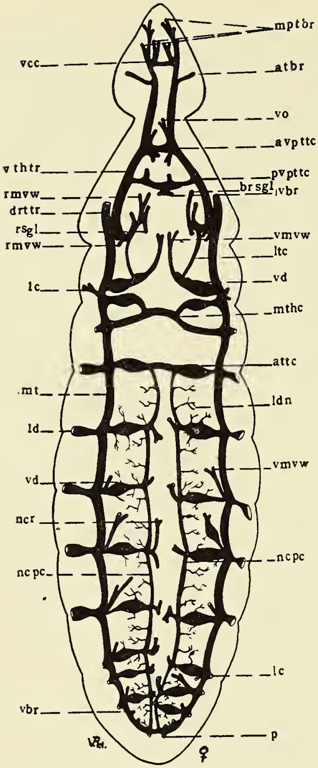

mptbr
vcc
atbr
vo
avpttc
vthtr
pvpttc
brsgl
lvbr
rmvw
drttr
rsgl
rmvw
vmvw
ltc
lc
vd
mthc
attc
mt
ldn
ld
vmvw
vd
ncr
ncpc
ncpc
lc
vbr
p
V.P.H.
♀

Fig. 19.

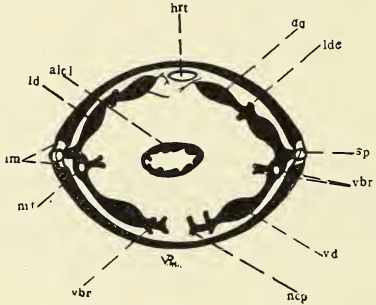

hrt
dd
lde
alcl
ld
sp
im
vbr
mr
vd
vbr
ncp
V.P.H.

Fig. 20

DESCRIPTIONS OF NINE NEW SPECIES OF BRYOCORINAE (HEMIPTERA, MIRIDAE).[1]

By HARRY H. KNIGHT, Ames, Iowa.

Caulatops barberi n. sp.

Differs from *agavis* Reut. in the uniformly fuscous hemelytra, without violaceous tinge or pale costal margin; membrane and areoles uniformly fuscous, calli and scutellum reddish.

♂. Length 4.5 mm., width 2 mm. Head: width 1.35 mm., vertex .76 mm.; pale to yellowish brown, tylus with fuscous on middle then changing to reddish on apical one-third; frons with an indistinct, arcuate fuscous mark each side of median line. Rostrum, length 1.86 mm., reaching upon middle of venter, the apex of segment II reaching to middle of hind coxae, while the last two segments are much thickened and very short; yellowish to brown. Antennae: segment I, length .43 mm.; II, .98 mm., cylindrical, slightly more slender than segment I; III, missing; color uniformly brownish black, with fine, short pale pubescence. Pronotum: length .74 mm., width at base 1.49 mm.; pale to yellowish brown, calli reddish; calli large, strongly convex, nonpunctate, pale pubescent as on other parts of pronotum; remaining half of disk closely but very finely punctate. Scutellum and mesoscutum reddish (hypodermal), clothed with short pale pubescence; scutellum with impressed line each side starting at basal angle and curving inward and apically, thus dividing the disk into three nearly equal parts.

Hemelytra uniformly fuscous, opaque; membrane pale fuscous, areoles somewhat darker, veins of the same dark color as cuneus and corium; clothed with rather short pale pubescence as on the head, pronotum and body. Legs pale yellowish, posterior face of femora with a few fuscous points, the hind pair becoming darkened with fuscous on apical half; hind tibia and tips of tarsi becoming fuscous. Venter reddish to fuscous, the sternum and pleura more fuscous. Genital segment remarkably developed, the posterior aspect forming a broad basin, the left clasper apparently united with segment wall and forming the ventral edge of this basin, the base of clasper developed into a posteriorly directed horn, the acuminate tip slightly incurved, the inner surface of horn flattened, whitish in color and forming a continuous surface with the hollow basin. Right clasper greatly developed, forming a broadly curved cylindrical arm which extends across the hollow basin, becoming somewhat more slender apically, the apex with a slight hook which rests on top at base of the horn of left clasper.

---

[1] Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

Holotype: ♂, July 29, 1905, Huachuca Mts., Arizona (H. G. Barber); author's collection. Named in honor of my friend the collector, Mr. H. G. Barber, who is well known for his work on the family Lygaeidae.

Cyrtocapsus caligineus aureopubescens n. var.

Differs from *caligineus* Stål by the golden, sericeous, almost scale-like pubescence, by the more uniformly black hemelytra, and probably by the deeply impressed points between and on posterior margins of calli.

♀. Length 3.1 mm., width 1.7 mm. Head: width .88 mm., vertex .38 mm.; front transversely striate, the vertex finely and irregularly punctate; median line of front and inner margins of eyes indicated by more thickly set golden, sericeous pubescence, the latero-posterior margin of eye emarginate and fringed with silvery sericeous pubescence; black, the bucculae and lora pale, juga and sides of tylus brownish. Rostrum, length .83 mm., reaching to middle of intermediate coxae, pale yellowish, brownish at tip. Antennae: segment I, length .43 mm., thickness .073 mm., slightly bent, more slender on basal one-third; II, .63 mm., slender at base, gradually becoming thicker apically where it attains the thickness of segment I; III, .48 mm., slightly more slender than apex of segment II; IV, .67 mm., thus longer than segment II, slender; pale to yellowish, segment IV dusky, fuscous at apex; clothed with fine yellowish pubescent hairs, becoming longer and more erect on segment IV.

Pronotum: length .86 mm., width at base 1.36 mm., width at anterior angles .80 mm.; disk strongly convex on basal half, as viewed from normal dorsal aspect sharply declivitous anteriorly; basal margin transverse immediately above the sharply elevated mesoscutum, then slightly sinuate laterally, where a distinct basal impression occurs on disk just before basal angles; disk densely and evenly punctate, the calli also finely punctate, calli prominent, separated by a deep impression, their margins sharply impressed, a foveate depression on basal margin of each and a broader one at outer angles. Scutellum flattened at base but the median apical area distinctly convex; mesoscutum sharply elevated and exposed beneath basal margin of pronotum.

Hemelytra black, opaque; embolium broad, distinctly thickened, and separated from the corium by a deeply impressed line, embolar margins nearly straight along middle then curving inward at apex to meet the distinct fracture and strongly deflexed cuneus; membrane whitish on apical half, basal half fuscous, the veins and areoles black. Dorsum and propleura clothed with golden sericeous, almost scale-like pubescence, the meso- and metapleura and sides of venter clothed with silvery, sericeous pubescence. Thorax and venter black; legs pale to yellowish, middle and posterior coxae becoming fuscous; arolia very similar in form to those of *Sixeonotus insignis* Reut.

Holotype: ♀, November 11, 1924, Dunedin, Florida (W. S. Blatchley); author's collection.

Heterocoris cyaneus n. sp.

Distinguished from *dilatatus* Guér.-Mén. by the deep cyaneous metallic color, impunctate scutellum, and relatively longer antennal segments.

♀. Length 5.2 mm., width 2.6 mm. Head: width 1.06 mm., vertex .56 mm.; the width of vertex only equal to little more than twice the transverse dorsal width of an eye; eyes prominent, having an evident outward and backward slant, the latero-posterior margins strongly sinuate. Rostrum, length 1.31 mm., scarcely attaining posterior margins of middle coxae, pale. Antennae: segment I, length .68 mm., greater than width of vertex; II, 1.11 mm., slightly greater than width of head; III, .74 mm.; IV, .46 mm., distinctly more slender than III; pale, segment IV fuscous; pale pubescent. Pronotum: length 1.29 mm., width at base 1.86 mm.; rather densely and strongly punctate, the area in front of calli included; cyaneous, strongly shining. Scutellum impunctate, dull, strongly impressed on base although the median line evidently convex; mesoscutum not exposed.

Clothed with prominent, dense, erect pubescence, which is pale on head, pronotum and venter, but fuscous on hemelytra and scutellum; legs pale pubescent; membrane with apical marginal area of areole and the broad vein distinctly pubescent. Hemelytra impunctate, opaque; embolium broad, arcuate, thickened and broadly reflexed, the cuneal fracture profound, the outer half of base rounded away and not touching the embolium. Membrane brownish black, the large areole included, the broad vein black, exterior to the areole and distad of a line drawn transversely across its apex, white; the brownish black areas giving a cyaneous or purplish sheen in certain lights.

Color of dorsum distinctly cyaneous, giving purplish reflections in certain lights, pronotum strongly shining, hemelytra and scutellum opaque, but exhibiting the same cyaneous coloration; ventral surface black, legs and rostrum pale.

Holotype: ♀, Havana, Cuba (C. F. Baker); author's collection. *Paratype:* ♀, topotypic; in collection of Mr. W. J. Gerhard, to whom the author is indebted for the type; ♀ March 28, ♀ June 9, 2 ♀ ♀ July 3, 1925, Soledad, Cuba (J. G. Myers and George Salt).

Pycnoderes balli n. sp.

Distinguished by the small size and evenly arched nonlobate pronotal disk; hemelytra nearly as in *quadrimaculatus* Guér. but embolium with pale spot only at apex and the outer edge more thickened, thus not so sharp.

♂. Length 2.5 mm., width 1.2 mm. Head: width .60 mm., vertex .33 mm.; black, shining; vertex, median line, more broadly on lower part of front, and bordering eyes, distinctly punctate. Rostrum, length .57 mm., reaching to middle of mesosternum, pale to dusky, apex and first segment fuscous. Antennae: segment I, length .23 mm.; II, .41 mm.; III, missing; pale. Pronotum: length .76 mm., width at base 1.03 mm.; disk strongly and evenly arched, nonlobate, being without sulcate median line, although a slight yet apparent depression occurs each side near basal angles; coarsely and closely punctate, each puncture bearing a pale decumbent pubescent hair, strongly shining. Scutellum coarsely punctate, covered at base by the overhanging pronotal disk. Hemelytra nearly as in *quadrimaculatus* Guér. but embolar margins not so strongly arcuate, outer edge not sharp, the embolium more nearly of equal width throughout; black, opaque, embolium somewhat shining, with a single small pale spot on apex; very finely pale pubescent. Cuneus pale yellowish translucent, narrowly black on basal angle. Membrane pale, anal area, veins and basal half of areole, fuscous. Thorax and venter black and strongly shining, pale pubescent. Legs pale, anterior aspect of front coxae fuscous, hind femora blackish on apical two-fifths, tarsi and apical one-third of tibiae distinctly yellowish.

Holotype: ♂, August 25–30, 1925, Sanford, Florida (E. D. Ball) author's collection; 2 ♂ 1 ♀ April 9, 4 ♂ 2 ♀ May 15, 1926, Sanford, Florida (E. D. Ball). Named in honor of the collector, Dr. E. D. Ball, who kindly presented this and other Florida Mirids.

Pycnoderes balli obscuratus n. var.

Apparently not differing structurally from *balli,* but with antennae and legs chiefly blackish, hind femora pale only at base; vertex with yellowish spot each side next the eye; embolium with obsolete pale spot on apex and a second one near base; cuneus with blackish margins, leaving a large translucent pale spot on its disk; membrane fuscous, although somewhat paler near apical margins.

♂. Length 2.3 mm., width 1.1 mm. Head: width .60 mm., vertex .33 mm. Antennae: segment I, length .23 mm.; II, .45 mm.; III, .44 mm.; IV, .54 mm. Pronotum: length .76 mm., width at base 1.03 mm.

Type: ♂, July 28, 1900, Philadelphia, Pennsylvania (W. J. Gerhard); author's collection.

Pycnoderes medius n. sp.

Allied to *dilatatus* Reut., but differs in the smaller size, fuscous membrane, and the broader, more heavily gibbous bilobed pronotal disk; differs from *quadrimaculatus* Guér. and *incurvus* (Dist.) by the sharp outer edge of the embolium.

♂. Length 2.9 mm., width 1.37 mm. Head: width .63 mm., vertex .37 mm.; black, juga and lora more brownish. Rostrum, length .67 mm., reaching hind margin of mesosternum. Antennae: segment I, length .27 mm.; II, .60 mm.; III, .57 mm.; IV, .68 mm.; pale, segment IV fuscous.

Punctuation, pubescence, and coloration nearly as in *dilatatus* Reut. but hemelytra not so broadly dilated; the apical pale spot on embolium sometimes nearly obsolete. Membrane and veins distinctly fuscous, darker at base and on veins, apical margins paler and more brownish. Legs pale, front coxae except apex, and apical half of femora fuscous to blackish.

♀. Length 2.8 mm., width 1.36 mm.; very similar to the male in form and coloration.

Holotype: ♂, July 22, 1916, Hollister, Missouri (H. H. Knight); author's collection. *Allotype:* same data as the type. *Paratypes:* 10 ♂, 23 ♀, taken with the types. ♂, July, 1915, Clarksville, Tennessee (G. G. Ainslie). ♀, September 15, 1921, Leland, Mississippi (C. J. Drake).

Pycnoderes drakei n. sp.

Closely allied to *medius* but the scutellum distinctly flatter and exposed at base; pronotum higher and more deeply bilobed, and punctuation of disk somewhat finer; membrane more heavily and uniformly fuscous, but with clear area in apical half of areole bordering cuneus. Suggestive of *incurvus* (Dist.) in the high bilobed pronotum, but distinguished at once by the sharp edge of the embolium.

> ♀. Length 2.9 mm., width 1.4 mm. Head: width .63 mm., vertex .33 mm. Rostrum, length .71 mm., reaching to middle of intermediate coxae. Antennae: segment I, length .28 mm.; II, .56 mm.; III, .60 mm.; IV, .71 mm.; pale, segment IV dusky. Pronotum: length .83 mm., width at base 1.09 mm.
>
> Coloration nearly as in *medius* but differs as follows: head yellowish brown, vertex and median line of front black, bordering lower edge of eyes and the convex portion of tylus blackish; embolium with much larger pale spot on basal half, the apical spot obsolete; membrane more uniformly dark fuscous, not distinctly brownish on apical area; apical half of areole with large clear spot bordering the clear cuneus; base of cuneus not invaded by black from corium; the embolium apparently broader and more suggestive of *dilatatus* Reut.

Holotype: ♀, June 26, 1921, Aberdeen, Mississippi (C. J. Drake); author's collection.

Pycnoderes infuscatus n. sp.

Allied to *dilatatus* Reuter, but size larger; distinguished by the longer antennal segment II which exceeds width of head, and by the fuscous membrane.

> ♂. Length 4 mm., width 2.4 mm. Head: width .71 mm., vertex .40 mm.; eyes smaller than in *dilatatus* and head more produced, space between lower margin of eye and tip of tylus distinctly greater than height of an eye. Rostrum, length 1 mm., reaching to middle of intermediate coxae. Antennae: segment I, length .34 mm.; II, .78 mm.; III, missing; pale, apical half of segment II fuscous. Pronotum: length 1.16 mm., width at base 1.46 mm.; disk more broadly gibbous than in *dilatatus* and median line not so deeply impressed; apex of scutellum more depressed but basally more sharply convex than in *dilatatus*. Hemelytra nearly as in *dilatatus*, but membrane fusco-brownish, veins and basal area blackish.

Legs pale to yellowish, femora and front coxae blackish, bases of femora pale, the hind pair with apical half only blackish.

Holotype: ♂, July 14–August 5, 1912, Black Mountains, North Carolina (Beutenmuller); Cornell University collection.

Sixeonotus albohirtus n. sp.

More elongate than *tenebrosus* (Dist.); black, clothed with prominent, suberect, moderately dense, white pubescent hairs.

♀. Length 2.6 mm., width 1.17 mm. Head: width .71 mm., vertex .41 mm. Rostrum, length .64 mm., just attaining hind margin of sternum. Antennae: segment I, length .21 mm.; II, .37 mm.; III, missing; black, white pubescent. Pronotum: length .80 mm., width at base 1.11 mm.; disk punctate and convex much as in *tenebrosus* but more elongate and not so wide. Scutellum fully exposed, moderately convex, punctures finer than those of pronotum. Hemelytra moderately shining, clothed like other parts of the body, with rather long, moderately dense, suberect, white pubescent hairs. Membrane dark fuscous, somewhat paler on middle between the apices of areoles, veins black and bearing evident, fine short pubescence. Wholly black except trochanters, apices of coxae, and first two segments of tarsi which are pale.

Holotype: ♀, August 25–30, 1925, Sanford, Florida (E. D. Ball); author's collection.

Sixeonotus brevis n. sp.

Allied to *tenebrosus* (Dist.), but distinguished by the flatter and more elongate pronotum, broadly exposed scutellum, abbreviated membrane, and pale yellowish legs.

♀. Length 2.3 mm., width 1.3 mm. Head: width .70 mm., vertex .43 mm.; frons more prominent and base of tylus more deeply incised than in *tenebrosus;* black, narrowly pale bordering eyes above, juga brownish, darker at base. Rostrum: length .60 mm., attaining hind margin of sternum, pale, epipharynx and apex blackish. Antennae: segment I, length .20 mm.; II, .40 mm.; III, missing; black, finely pale pubescent. Pronotum: length .74 mm., width at base .97 mm.; disk strongly flattened on anterior half, lateral margins distinctly sulcate although broadly rounded at basal angles, basal margin sulcate at median line and scarcely covering base of scutellum; disk coarsely punctate much as in *tenebrosus*. Scutellum rather flat, with several coarse punctures on basal half. Black; hemelytra clothed with prominent, erect, pale yellowish pubescence, similar to that on head and pronotum; embolar margins more strongly arcuate on apical half than in *tenebrosus*; membrane abbreviated, extending beyond cuneus for a space equal to its length, rather uniformly pale fuscous, veins black. Legs uniformly pale yellowish, pale pubescent.

Holotype: ♀, August 10, 1921, Hattiesburg, Mississippi (C. J. Drake); author's collection.

ON SOME HETEROPTERA FROM THE CANAL ZONE, COLLECTED BY DR. J. G. SANDERS.

By J. R. de la Torre-Bueno, White Plains, N. Y.

These few bugs are from the collection of the Bureau of Plant Industry, Harrisburg, Pa., and were submitted to me for determination. They are here set forth for the purpose of recording the new localities for distributional studies.

Limnometra opaca Champ.

Two from Gamboa; a common species recorded by Champion from Bugaba.

Montina nigripes Stål.

Panamá—A species reported from Chiriqui and Colon in Biologia Centrali Americana.

Sinea caudata Champ.

Gamboa, 16. II. 21.—Described from the Isthmus.

Madura perfida Stål.

Alajuela, 2. II. 21—A species which seems not to have been reported from the Isthmus of Panama.

Hypselonotus atratus Fabr.

Gamboa, 14. II. 21—A long series.

Dysdercus obliquus H. S.

Panamá, whence it has been previously reported.

D. concinnus Stål.

Alajuela, Panamá, 11 II. 21—Seems not to have been reported thence.

Corizus sidae Fabr.

Gamboa, 31. I. 12—The common Tropical American and Antillean form.

UNDESCRIBED SPECIES OF THE GENUS LIMNOPHILA FROM EASTERN NORTH AMERICA (Tipulidae, Diptera).

Part I.

By Charles P. Alexander, Amherst, Mass.[1]

During the past few years, numerous species of undescribed Tipulidae from Eastern North America have come to hand and have been diagnosed. In the present paper, the writer discusses species of the genus *Limnophila* pertaining to the subgenera *Ephelia* Schiner and *Phylidorea* Bigot. The material upon which this paper is based is largely contained in material taken by the writer; in extensive series of crane-flies taken by Professor J. Speed Rogers in Michigan, Indiana, Tennessee and Florida; and in collections from Ontario made by Mr. C. Howard Curran. A few additional specimens considered at this time were included in the U. S. National Museum and U. S. Biological Survey Collections and in an extensive series of Adirondack Tipulidae sent to me by Mr. Howard Notman. I would express my sincere thanks to all of the above mentioned entomologists for co-operation in making known the crane-fly fauna of the country.

Limnophila (Ephelia) solstitialis n. sp.

Male.—Length about 5 mm.; wing, 6–6.2 mm.

Female.—Length about 6.5 mm.; wing, 7–7.5 mm.

Generally similar to *L.* (*E.*) *aprilina* O. S., differing especially in the average smaller size, different wing-pattern and the structure of the male hypopygium.

> Praescutum with the intermediate pair of brown stripes having the two ends narrowly confluent; the short sublateral stripes tending to fuse with the intermediates at their anterior ends. Wings with a more abundant pattern, the clouds and seams along the cord, outer end of cell *1st* M_2 and at the ends of the longitudinal veins more broken; two, or sometimes three, brown spots in the outer end of cell *2nd A,* there being a small spot at the end of vein *2nd A,* with a larger, more basal area lying near the outer ends of cells *1st A* and *2nd A,* in transverse alignment with the large costal blotch at the origin of *Rs.* The supernumerary cross-vein lies a

---

[1] Contribution from the Department of Entomology, Massachusetts Agricultural College.

little distad of the level of the origin of *Rs* so the brown seam surrounding it is not in alignment with the two dark markings last described.

Male hypopygium with the outer dististyle long and slender, the apical portion still more narrowed and split at tip into two short, divergent points; outer margin at near four-fifths the length of the style with an acute or subacute tooth. Inner dististyle extensive.

Habitat: Eastern North America.

Holotype, ♂, Woodworths Lake, Fulton Co., New York, altitude 1,600 feet, July 7, 1916 (C. P. Alexander). *Allotopotype,* ♀. *Paratopotypes,* 5 ♂ ♀; Cincinnatus, Chenango Co., New York, July 20, 1916 (Alexander); Vandenburg's, Fulton Co., New York, June 9, 1911 (Alexander); Ridgewood, New Jersey, July 5, 1911, and August 16, 1912 (M. D. Leonard); Glen Echo, Maryland, July 4, 1921, July 9, 1922, August 6, 1922 (J. R. Malloch), in U. S. Biological Survey Collection; Glencarlyn, Virginia, June 4–11, 1911 (Fred. Knab), in the U. S. National Museum Collection; near Great Falls, Virginia, August 11, 1915 (W. L. McAtee); ♂ ♀, Allardt, Fentress Co., Tennessee, altitude 1,200–1,300 feet, June 28–July 2, 1924 (J. S. Rogers), Collector's Nos. 62, 69.

The specimens of *L. aprilina* mentioned by Osten Sacken (Mon. Dipt. N. Amer., Part 4: 224, 1869; last paragraph) probably refer to *solstitialis.* Likewise all records for *aprilina* in my "Crane-flies of New York, Part I: 809–810; 1919" pertain to *solstitialis* with the exception of the Tompkins Co. records, which refer to *aprilina.* In Johnson's "Diptera of New England," p. 29; 1925, all the records presumably refer to *solstitialis* with the single exception of the material taken at Whately Glen, Massachusetts, by the writer which again pertain to *aprilina.* It is probable that *aprilina* flies much earlier than *solstitialis* and most records for June to August pertain to this latter species. The records for *aprilina* and *solstitialis* are very confused. I am indebted to Dr. Nathan Banks of the Museum of Comparative Zoology for critical notes on the type-series of *aprilina;* from these notes it is very apparent that Osten Sacken had two species confused in his original series and that a third species from California was later added when the material from the "Western Diptera" was incorporated in the collection.

Limnophila (Ephelia) serotinella n. sp.

Male.—Length about 4.2–4.3 mm.; wing, 5–5.3 mm.

Female.—Length about 4.2 mm.; wing, 4.8 mm.

Very similar to L. (*E.*) *solstitialis* n. sp., differing conspicuously in the structure of the male hypopygium.

The size is smaller than all but the smallest individuals of *solstitialis.* The wing-pattern is somewhat heavier, there being in cases three dark markings across the outer end of the last anal cell. The male hypopygium has the outer dististyle small, the basal half dilated, thence suddenly narrowed to the acute simple apex; the usual lateral spinous lobe is also slender but blunt at the tip, placed far out at the apex of the style; the inner or cephalic margin of the style at its widest point is produced into an obtuse lobe. Inner dististyle short and broad.

Habitat: Tennessee.

Holotype, ♂, Allardt, Fentress Co., altitude 1,650 feet, September 3, 1924 (J. S. Rogers), No. 136. *Allotopotype,* ♀. *Paratopotypes,* ♂ ♀.

Type returned to Professor Rogers.

Limnophila (Phylidorea) platyphallus n. sp.

General coloration chestnut-brown, the praescutum darker medially; head gray; fore and middle femora black, the basal fifth yellow; posterior femora with the distal third dark brown; wings whitish subhyaline, the costal region infuscated; abdomen brownish yellow, with a dark subterminal ring; male hypopygium with the aedeagus a very flattened and compressed black blade.

Male.—Length about 6.5 mm.; wing, 8–8.3 mm.

Rostrum and palpi dark brown. Antennae with the scapal segments dark brown, the first slightly pruinose, the second segment somewhat brownish yellow; flagellum obscure yellow, near midlength of the organ passing into brown. Head clear gray, on the posterior vertex extending backward as a triangular point, the sides of the vertex darker.

Pronotum dark brown, paler laterally. Mesonotum chestnut-brown, darker brown medially, subnitidous, the lateral margins of the sclerite more yellowish, the surface of the notum with a very sparse pollen; scutum dark chestnut-brown, the median area heavily pruinose; posterior callosities and the scutellum obscure yellow, the parascutella darker; postnotum reddish brown, pruinose. Pleura light brown, sparsely pruinose. Halteres yellow, the knobs dark brown. Legs with the coxae and trochanters testaceous yellow; fore and middle femora black, the basal fifth conspicuously light yellow; posterior femora obscure yellow, gradually darkening beyond the basal fourth, the distal third strongly infuscated; tibiae brown, the tips broadly darkened; tarsi brownish black, the basitarsi vaguely paler on their proximal half. Wings whitish subhyaline, cells *C*, Sc_1, *2nd* R_1, apex of R_2 and, in cases, the tip of cell R_3 strongly infuscated; stigma oval, slightly darker brown; cell *Sc* and prearcular region more yellowish; veins dark brown. Venation: *Rs* varying from arcuated to weakly angulated and short-spurred at origin; cell R_2 at wing-margin about one-third wider than cell *2nd* R_1; cell *1st* M_2 relatively small; *m–cu* placed at about two-thirds its length beyond the fork of *M*.

Abdominal tergites brownish yellow, narrowly darker laterally; segments eight and nine dark brown in male to form a conspicuous subterminal ring; hypopygium and sternites pale. Male hypopygium with the basistyles relatively short and stout. Outer dististyle pale, flattened, the apex truncated, only the apical outer angle a little produced into a small blackened point. Inner dististyle small, the basal half with a prominent setiferous shoulder on the outer margin, the apical half of the style suddenly narrowed into a long, slender point that is provided with delicate setulae. Gonapophyses elongate, the bifid apophyses with the outer arm a long blackened blade, the ventral arm very small, acicular. Aedeagus blackened, very flattened, in a position of rest appearing as a compressed blade; on slides flattened into a broad pod-shaped structure.

Habitat: Northeastern North America.

Holytype, ♂, Lake May, Berkshire Co., Massachusetts, in sphagnum bog, altitude 1,500 feet, July 1, 1925 (C. P. Alexander). *Paratypes,* 1 ♂, Orono, Maine, June 6, 1913 (Alexander); 1 ♂, Orillia, Ontario, June 10, 1925 (C. H. Curran); 1 ♂, Gogebic Co., Michigan, July 28, 1920 (J. S. Rogers), Collector's No. 21.

Type in the collection of the writer; paratypes in the collections of Professor Rogers and the Division of Entomology, Canada.

This interesting fly is most closely allied to *L.* (*P.*) *novae-angliae* Alex. which is likewise a northern species. Both have the curious flattened aedeagus but in all other respects are very different flies. *L.* (*P.*) *adjuncta* Dietz (Can. Ent., 52: 6–7; 1920) is doubtfully distinct from *L.* (*P.*) *terrae-novae* Alex. (Journ. N. Y. Ent. Soc., 24: 123; 1916). The venational and colorational differences indicated by Dr. Dietz are well within the limits of specific variation.

Limnophila (Phylidorea) auripennis n. sp.

General coloration shiny ferruginous yellow; antennal flagellum yellow; femora and tibiae uniformly yellow; wings strongly tinged with yellow, the costal margin more saturated; wing-tip and the cord vaguely seamed with darker; abdomen (♂) without a dark subterminal ring; male hypopygium with the aedeagus slender, the apex gently curved.

Male.—Length about 9 mm.; wing, 9.5 mm.

Female.—Length, 11.5 mm.; wing, 11 mm.

Rostrum and palpi dark brown. Antennae with the basal segment dark brown, the succeeding segments yellow, the terminal segments a little more infuscated. Head gray, the sides of the vertex behind somwhat darker.

Pronotum and mesonotum shiny ferruginous, the lateral margins of the praescutum and the posterior sclerites of the notum more yellowish. In some cases, the praescutum is more darkened, especially antero-medially. Pleura ferruginous yellow, the pteropleurite and the sclerites behind it sparsely pruinose, the sternopleurite shiny ferruginous yellow. Halteres pale, the knobs more infuscated. Legs with the coxae and trochanters ferruginous yellow; femora and tibiae uniformly yellow, the tarsi passing into dark brown, the bases of the two proximal segments paler than their tips; in some cases, the legs are yellow with the exception of the terminal two tarsal segments only. Wings strongly tinged with yellow, the base and costal region clearer yellow; stigma oval, pale brown; very pale brown washes in the outer ends of cells R_2 and R_3 and as vague seams along the cord and outer end of cell *1st* M_2; veins yellow, in the darker areas passing into brownish yellow. Venation: Rs short, feebly angulated at origin; veins R_2 and R_3 gradually diverging; cell R_2 at wing-margin fully one-half wider than cell *2nd* R_1; cell *1st* M_2 small, elongate, hexagonally-rectangular; cell M_1 about equal to its petiole.

Abdominal tergites ferruginous yellow, in some females the intermediate segments more infuscated. Basal sternites clearer yellow, the outer segments a little darker. Male hypopygium with the outer dististyle pale, gently expanded beyond midlength into a rather broad blade, the outer apical angle with a conspicuous blackened chitinized hook. Inner dististyle relatively slender, the base at outer margin slightly dilated but glabrous, the slender apical portion with scattered setae, a few of which are elongate. Aedeagus relatively long and slender, the apex gently curved. Bifid gonapophyses appearing as broad diverging wings, the tips of both arms acute, the cephalic spine nearly as long as the outer but more slender. Simple gonapophyses long and very slender, diverging.

Habitat: Northeastern North America.

Holotype, ♂, Antioch, Lake Co., Illinois, June 16, 1920 (C. P. Alexander). *Allotopotype,* ♀. *Paratopotype,* ♀; *paratypes,* 1 ♀, Mt. Kineo, Maine, August 17, 1913 (C. P. Alexander); 1 ♀, Keene Valley, Essex Co., New York, August 20, 1920 (H. Notman); 4 ♀♀, Ithaca, Tompkins Co., New York, May 29, 1916 (Alexander); 1 ♂, Brookview, Rensselaer Co., New York, June 12, 1923 (Alexander); 1 ♂, Orillia, Ontario, June 10, 1925 (C. H. Curran).

Type in the collection of the writer.

The male hypopygium of this species was figured as *L.* (*P.*) *adusta* O. S. in an earlier paper by the writer (Psyche, 18: 203, pl. 16, fig. 9; 1911).

Limnophila (Phylidorea) nigrogeniculata n. sp.

General coloration shiny ferruginous; head dark; antennae beyond the first segment yellow; femora yellow, the tips narrowly and abruptly brownish black; wings with the tips infuscated; *Rs* short; male hypopygium with the gonapophyses that subtend the aedeagus profoundly bifid.

Male.—Length about 5–5.5 mm.; wing, 6–6.5 mm.

Female.—Length about 6.5–8 mm.; wing, 6–8 mm.

Rostrum and palpi dark brown. Antennae with the first scapal segment dark brown, the remainder of the organ yellow, only the terminal segments a trifle infuscated. Head blackened, appearing greasy in the material available, and probably gray pruinose in fresh specimens.

Pronotum dark brown medially, the sides ferruginous yellow. Mesonotum shiny ferruginous, the lateral margins of the praescutum paling to yellow, the median area with a vague darker capilliary vitta that is better indicated anteriorly; scutellum and median area of the postnotal mediotergite with a brown suffusion. Pleura pale reddish testaceous. Legs with the coxae reddish testaceous; trochanters yellow; femora yellow, the tips narrowly and abruptly brownish black, the amount subequal on all the legs; tibiae yellow, the tips very narrowly darkened; basitarsi brownish yellow, the tips darker, remaining segments of the tarsi passing into dark brown. Wings with a yellowish tinge, cells *C* and *Sc* more saturated; stigma oval, dark brown; wing-apex faintly but broadly and evenly infuscated; veins dark brown.

Venation: Sc relatively short, Sc_1 ending opposite or just before the fork of Rs, Sc_2 longer than Sc_1; Rs very short, angulated to short-spurred at origin; r faint, at tip of R_1; cell M_1 a little shorter than its petiole.

Abdominal tergites obscure yellow, the caudal margins of the segments narrowly but conspicuously infuscated; segment eight (♂) brownish black, more conspicuous ventrally; hypopygium yellow; sternites obscure yellow. Male hypopygium having the ninth tergite with a very conspicuous U-shaped median notch. Outer dististyle heavily chitinized throughout, gently dilated beyond midlength, the apex terminating in two small teeth, the outer one smaller. Inner dististyle shorter than the outer, narrowed and strongly curved to the slender tip. Gonapophyses long and slender, the pair subtending the aedeagus straight, each profoundly bifid, the arms slender; ventral apophyses appearing as slender diverging horns. Ovipositor with the sternal valves long and slender.

Habitat: Tennessee.

Holotype, ♂, Allardt, Fentress Co., altitude 1,650 feet, July 15, 1924 (J. S. Rogers), No. 90. *Allotopotype,* ♀, July 1, 1924; No. 67. *Paratopotypes,* several ♂ ♀, July 1–22, 1924; Nos. 67, 90, 111.

Type returned to Professor Rogers.

SOME REMARKS, AL VUELO, ON TINGITID NAMES.

By J. R. de la Torre-Bueno, White Plains, N. Y.

The highly useful and informing paper by Dr. C. J. Drake, on The North American Tingitidae described by Stål,[1] immediately poses two questions, one of which, as to the accuracy of his figures, he presumably has answered finally. He assures us of the competency of the artist; and he is so certain of it that he accepts Madam Ekblom's drawings as final and true representations of the species, from which to draw definite decisions. The other question disposed of is the one his paper purports to answer definitely—namely, the identity of the forms he discusses. But so far as one may form an idea from the reproductions of the drawings, two, at least, of the species still seem to be in an unsettled state and far from a final adjustment. And what this final adjustment may appear to be, with due weight attached to the drawings and what they reveal, is here set forth.

Based on the drawings, Dr. Drake synonymizes Stål's three species of *Melanorhopala* under the one name *clavata.* The identity of *lurida* with this species is unquestionable. Stål's own descriptions show that the differences between these two are unexistent, except for the difference in the clavation of the antennae. But in *M. uniformis* he makes the statement that antennal segment III is shorter than in the other two and that the narrow foliaceous margin of the prothorax is largely reflexed and touches the surface of the pronotum.

We now know that the difference between the antennae of *clavata* and *lurida* is sexual, but the differences between *uniformis* and the two former are more likely to be of a specific character. So much for the content of Stål's descriptions, so terse as to structure and so diffuse as to color.

The figures in Dr. Drake's paper at once reveal other and additional differences which to me seem specific—namely, the pronotal carinae and the membranal areoles, as well as the antennal segments. The figures of *Melanorhopala* are evidently to the same scale, × 10, so we can justly make comparisons of dimensions between them. Thus, we find that the antennal segments are in different proportions in two figures, in *a* (*clavata* type) (in their order) 4 : 2 : 30 : 3.6, in *c* (*uniformis* type), 2½ : 1½ : 28 : 4. The pronotal carinae in *a* are subparallel; in *c* they converge curvedly anteriorly. The pronotum in *a* is much shorter and narrower than in *c* (both macropterous) and the apex less acute;

---

[1] 1926—Ann. Carn. Mus. XVI: No. 3–4; 375–380, pl. XXXIV.

the areoles are larger in *a* than in *c,* in which they seem rounded and puncture-like. The wings are rounded in *a* and subacuminate in *c, although both are clearly macropterous;* the membranal reticulation is coarser in *c* than in *a.* And finally, there is a noticeably large areole, much larger than any of the others, in *c* near the apex of the marginal row of cells on the outer margin of the membrane; in *a* there is no such noticeably large cell in the membrane. Other differences will be noted on a careful examination of the figure, such as the comparative sizes of the heads, the form and size of the pronotum, etc. In the ordinary course of descriptions, this aggregate of differential characters would seem to be sufficient to delimit that technical concept we are pleased to denominate a species and in consequence it does not appear from the evidence presented that *Melanorhopala uniformis* Stål must be "spurlos versenkt" into the invidious oblivion of synonymy, but rather retained as a distinct species, whatever may be the evidential doom of *M. lurida.*

In *Acalypta thomsonii* another situation obtains. The antennae are not shown in the figure, being missing in the type, hence it is not possible to check them up with the description. But the carinae of the thorax may be. Now, Stål states: "Pronotum tricarinatum, etc., . . . which forms a determinate picture. But in the figure (Fig. d, pl. XXXIV) the lateral carinae are so effaced as to be unseen, which difference Dr. Drake notes in his comments (*op. c.,* p. 377); and he also draws attention to the differently shaped paranota in the form from the Northeastern United States we have called *thomsonii;* and to its having two spines in the head. To this it may be added (from specimens) that the elytral reticulations are small, circular and not angular in outline; the lateral carinae are one-third the length of the middle, distinct but very much lower, straight and converging anteriorly.

This, of course, leaves our Northern States species without a name; and acordingly, we may know the species diagnosed by me in this BULLETIN, Vol. XIX, p. 50, as

Acalypta **madelinae**. Type: Brachypterous ♂, Sherborn, Mass., 7. x .23; paratype (and allotype), brachypterous ♀, Framingham, Mass., 13. x .23; paratype ♀, same date; all taken by Mr. C. A. Frost by sifting at the base of alders in a swamp. These are the three specimens recorded by me in this BULLETIN, Vol. XIX, p. 50.

How fortunate it is that this species has received so little attention! Wherefore, we have no complicated maze of synonymy to waste time in penetrating; nor lengthened excursi to sift for the proverbial grain of wheat.

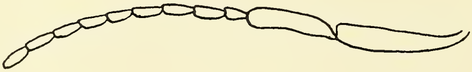
NOTE ON THE BLISTER BEETLE MACROBASIS MURINA LEC.

By F. H. Chittenden, U. S. Department of Agriculture,
Washington, D. C.

Attention has been called by W. S. Fisher, Bureau of Entomology,[1] to the validity of Le Conte's *Lytta murina,* described in 1853, from Lake Superior. He records its occurrence in different localities in Michigan, Minnesota, the Dakotas, and Nebraska, and cites injury to the pea tree (*Caragana* sp.). Previous records, together with those which will be mentioned, indicate that the species belongs to our Transition life zone, but its occurrence about New York City shows that its range includes a portion of the Upper Austral zone.

There are several unpublished records of this species in the Bureau of Entomology which add to our knowledge of its distribution and injurious habits. July 8, 1912, it was reported from Menominee, Mich., feeding on sugar beet. July 11, 1914, C. H. Buffman, Sheridan, Wyo., reported injury to potato. July 13, 1915, G. A. Drake, Brooklyn, N. Y., also reported injury to potato. May 3, 1917, Mrs. D. W. Moore, Chicago, Ill., reported serious injury for the previous two years. June 25, 1919, Mr. L. G. Gentner collected this species on potato at Hazelhurst, Wis.

Among specimens collected by members of the office of Cereal and Forage Insect Investigations, there is a series taken by H. E. Smith, at Concord, N. H., June 4, 1915, Franklin, N. H., June 9, 1915, Chelsea, Vt., September 7, 1915, and Manchester, N. H., July 25, 1916. Specimens are also present from Blue Ridge, N. Y., from the vicinity of Orono, Me., furnished by C. H. Batchelder, and from Massachusetts without definite locality. Specimens have been identified from all of these localities.



To facilitate recognition, the accompanying outline sketch of the male antenna is furnished.

---

[1] Proc. Entom. Soc. Wash., vol. 21, January, 1919, pp. 1, 2.

AN AMERICAN SPECIES OF THE GENUS PACHYPAPPELLA BAKER (Hom. Aph.).

By Alice P. Macdougall, Univ. of Toronto, Canada.

The genus *Pachypappa* was erected in 1857 by Koch with *P. marsupialis* and *P. vesicalis* as types. In 1909, Tullgren described a third species, *P. lactea,* which he considered similar to the above from the descriptions given by Koch. Upon examination of *P. marsupialis* it was evident that it was incorrectly placed, therefore Dr. A. C. Baker in 1920 proposed the new name *Pachypapella* with *P. lactea* Tull. as type and relegated *Pachypappa* Koch to synonymy.

Recently Tullgren has published another paper in which he discusses this problem. He admits that it is possible that *P. marsupialis* Koch is not rightfully a *Pachypappa* and that his species *P. lactea* decidedly belongs to *Pachypappella.* He points out, however, that *P. vesicalis* is still unaccounted for and suggests that for it should be retained Koch's original name *Pachypappa* since it was one of the species for which the genus was erected. He describes this species and also a new one *P. grandis* which is closely related to *P. vesicalis.*

In the course of this article he discusses *Schiz. reaumuri* Kalt, which both Del Guercio and Theobald have placed in the genus *Pachypappa.* He submits evidence to prove that this species does not belong here.

It would appear, therefore, that if *Pachypappa* be recognized as a legitimate genus, it will have at least two species, *P. vesicalis* Koch and *P. grandis* Tull. and that the genus *Pachypappella* has also two species *P. lactea* Tull. and *P. caudelli* n. sp. A key follows to separate these species, based on the key in Tullgren's "Aphidol. Stud. II." and characters observed by the author on examination of slides of *P. vesicalis* Koch and *P. caudelli* n. sp. and Tullgren's descriptions of *vesicalis, grandis* and *lactea.*

Apterae (Fundatrix).

Stem-mother without pores or wax plates........*Pachypappa*
Stem-mother with pores and wax plates.........*Pachypappella*

Alatae.

Without lateral rows of abdominal glands but with
dorsal pores and wax plates................*Pachypappa*

With lateral rows of abdominal glands, dorsal
pores and wax plates .... *Pachypappella*

From the slight generic differences recorded above, the wisdom of separating these species into two different genera appears to the author to be doubtful, but without access to original material and an intensive study of the literature, it is impossible at the present time to suggest any other solution.

Pachypappella caudelli n. sp.

This species, according to Tullgren's key and Baker's classification, is a true *Pachypappella.* It is an extremely common species in the interior of British Columbia on *Populus trichocarpa* and *P. tremuloides.* This species was taken during the summers of 1924 and 1925 by Mr. K. F. Auden of the University of Illinois and by the author, at Merritt, Penticton, and Bootahnie Valley. The first record of this species, however, is that of Mr. A. N. Caudell, of the U. S. National Museum, who collected it on *P. tremuloides* at Kalso, B. C., June 23, 1903. These specimens were kindly loaned by Dr. A. C. Baker of the U. S. Bureau of Entomology. The records then show a fairly wide distribution on the poplars of the lower slopes of the Cascades. There is no record of it ever having been taken in the Rocky Mountains or on the Pacific Coast, although the hosts have been well worked over in those districts.

The gall formed by this insect is very large and striking in appearance. The whole leaf is distorted into a globular shaped mass, in which, until about the end of June, is found a stem-mother and a large number of winged specimens, both immature and adult. The colony is closely attended by a species of ants which has been identified by Mr. E. R. Buckell of the Dominion Entomological Bureau as *Formica fusca* L. Only a small number of galls are found on each tree but all trees in the neighborhood are generally infested.

STEM-MOTHER.

General appearance:

The stem-mother is a large, globular object with a more or less shapeless appearance. It is quite inactive and often difficult to detect among the immature progeny and the folds of the inner surface of the gall. It appears a dull grey but is in reality a deep chocolate brown with a covering of white powder. No pores or wax plates can be detected on the un-treated specimens. The whole body is covered with short, fairly stout, upright hairs, scattered evenly over the surface. No cornicles are present.

Cleared specimens:

When cleared the appendages and vertex of the head as well as 6 pairs of lateral pores, are dull brown in contrast to the transparent appearance of the rest of the body. When examined closely, a number of wax pore plates can also be detected. These are scattered in profusion over the head and more scantily over the thorax and abdomen. They fall apparently into 8 lateral rows except in the head where there is no indication of any order. The cauda is concolorous with the rest of the body and can scarcely be distinguished from it. On the distal half of the antennal segment III is a single oval sensorium.

Measurements:

The size of this form varies considerably with the individual galls, depending, it would appear, to a certain extent upon the time of the year in which they were taken. The measurements are given of a cleared specimen which was chosen because its length agrees with the average length of seven specimens which were examined.

Length—3.66 mm., width of widest part of abdomen—2.55 mm., width of widest part of head—.92 mm.; antennal segments—III—.19 mm., IV—.06 mm., V—.14 mm.; length of hind tibia—.61 mm., length of hind tarsi—.2 mm.; diameter of wax pore plates—.04 to .09 mm.—the larger ones seem to be closer to the lateral margins.

Alate Viviparous Female.

General appearance:

The whole body is covered with short, fairly numerous hairs. The thoracic plates, vertex of the head, and eyes are very dark; the rest of the body is lighter; the antennae and legs are concolorous with the abdomen; the cauda is slightly paler; the wing veins are very dark. The fore-wing has media once branched in most cases, radial, sector, stigma and first anal vein slightly shaded. In the hind wing the radial sector, media and cubitus are present and prominent. In some fifty specimens examined no definite trace of cornicles was found. These insects are large, striking in appearance and are found in very great numbers in the galls in early summer. They are sluggish in habit, not one having been induced into flight. The tarsi appear proportionately very long and the head broad and flat.

Cleared specimens:

The thorax appears very dark and the appendages and head vertex darker than the abdomen; the cauda is concolorous with the abdomen. No trace of cornicles can be detected. A row of 4–6 pores is present on either side of the body. These are similar in size and appearance to those seen in the stem-mother. On ant. seg. III are found 8–10 sensoria grouped as in figure; on segment IV usually two sensoria around the distal end; on segments V and VI one large sensorium also near the distal end.

Measurements:

These are all fairly uniform in size; the measurements given are an average of sixteen specimens. Total length of body—3.6 mm., width of abdomen—1.6 mm., width of head through eyes—.5 mm.; length of hind tibia—2.1 mm., length of hind tarsi—.31 mm.; length of fore wing—4.6 mm., length of hind wing—3.07 mm.; antennal segments, III—.3 mm., IV—1.6 mm., V—1.8 mm., VI—2.51 mm.

This species is undoubtedly closest to *P. lactea* but the differences can easily be seen by referenc to the key below.

Type slides of the species are deposited in the Canadian National Collection; paratypes in the U. S. National Collection and in the author's collection.

KEY TO DISTINGUISH DESCRIBED SPECIES OF PACHYPAPPA KOCH AND PACHYPAPPELLA BAK.

Apterae (*Fundatrix*).

1. Long, numerous hairs 2
   Short, more scanty hairs 3
2. Antennal segment IV decidedly shorter than II. .*P. vesicalis*
   Antennal segment IV subequal to II. ....*P. grandis*
3. Antennal segment III with no sensoria. ....*P. lactea*
   Antennal segment III with one large sensorium. . .*P. caudelli*

Alatae.

1. With more than 1 sensorium on antennal segment IV. 2
   With only one sensorium on antennal segment IV. 4
2. With 8–12 subequal sensoria on ant. seg. II. 3
   With 10–14 sensoria, 1–2 smaller ones. ....*P. vesicalis*
3. With 3–4 sensoria on ant. seg. IV. ....*P. grandis*
   With 1–2 sensoria on ant. seg. IV. ....*P. caudelli*
4. With 4–6 sensoria on ant. seg. III. ....*P. lactea*

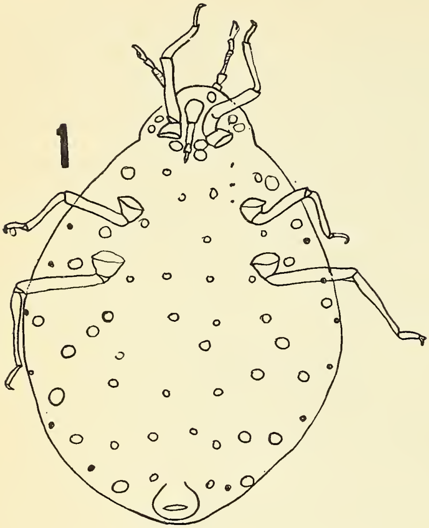
BIBLIOGRAPHY.

1857. **Koch, C. L.**, Die Pflanzenläuse.
1905. **Del Guercio**, Redia II, p. 306.
1909. **Tullgren, A.**, Aphidol. Stud. I, p. 69.
1915. **Theobald, F.**, Entomologist, 48, p. 73.
1920. **Baker, A. C.**, U. S. D. A. Bull. 826.
1925. **Tullgren, A.**, Aphidol. Stud. II, p. 10.

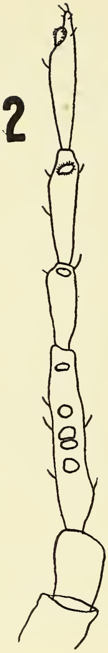
EXPLANATION OF PLATE.

1. Fundatrix, *Pachypappella caudelli.*
2. Antenna of alate female, *Pachypappella lactea* Tull.
3. Antenna of alate female, *Pachypappa grandis* Tull.
4. Antenna of alate female, *Pachypappa vesicalis* Koch.
5. Antenna of apterous female, *Pachypappella caudelli.*
6. Hind wing of *Pachypappella caudelli.*
7. Fore wing of *Pachypappella caudelli.*
8. Antenna of alate female, *Pachypappella caudelli.*

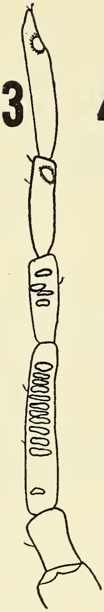
1



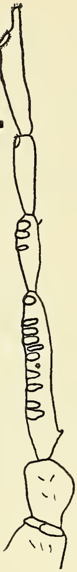
2



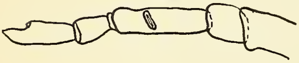
3



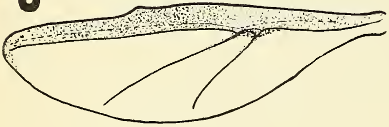
4



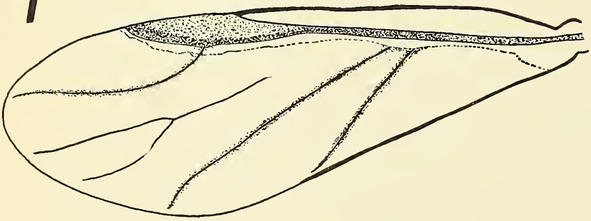
5



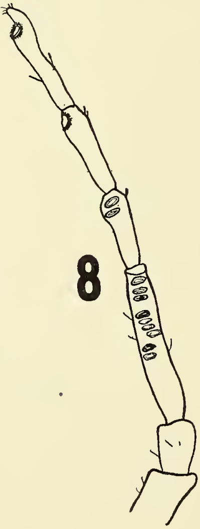
6



7



8



TWO NEW NAMES AND A CORRECTION IN SYNONYMY.

By H. C. Fall, Tyngsboro, Mass.

Two names used by the writer prove to be preoccupied; the following changes are therefore proposed.

For *Notiophilus obscurus* Fall substitute **N. obscuratus** new name.

For *Philhydrus elongatulus* Fall substitute **P. sublongus** new name.

The former name is preoccupied by a European species, now regarded as a synonym of *N. aquaticus,* while the latter was given in 1871 by M'Leay to an Australian species. I am indebted to M. D'Orchymont for calling my attention to this latter oversight.

Agrilus illectus Fall now proves to be a good species and not a synonym of *A. jacobinus* Horn. My error in announcing the identity of these two species (Ent. News, 1907, p. 176) was due to a mistaken identification of Horn's species, of which I have more recently seen genuine examples. The two species are closely allied but *illectus* may be distinguished by its more deeply impressed front, distinct dorsal channel of the pronotum and more or less emarginate prosternal lobe. In *jacobinus* the pronotum is without dorsal channel and the prosternal lobe is obtusely rounded. As I have already pointed out, *jacobinus* is out of place in Horn's table, the serration of the antennae really beginning with the fifth joint instead of the fourth; it is extremely close to *felix* with which Horn compared it, with however the mistaken notion that there was a difference in antennal structure. Both *jacobinus* and *illectus* should stand between *felix* and *impexus* in Horn's table.

It is very unfortunate indeed that in the new check list Mr. Leng felt constrained to follow the arrangement of species as given in Wytsman's Genera merely because of later publication. The results in *Agrilus* and *Chrysobothris* and many genera of the Elateridae are lamentable, and in certain cases amount to a veritable hodgepodge of our species. In these two families especially the student will do far better to follow the old Henshaw List, at least so far as the order of species in the genera is concerned.

AN UNDESCRIBED TINGITID FROM ARIZONA (HEMIPTERA).

By Carl J. Drake, Ames, Iowa.

Leptodictya nicholi n. sp.

Body elongate, oblong, flat. Antennae long, rather slender; segment I pale brownish, stouter and over twice as long as the second; segment II more or less pale brown, short; segment III yellowish white, four times as long as the fourth; segment IV not quite as long as the first and second conjoined, fusiform, more or less embrowned. Antenniferous tubercles rather long, blunt. Rostral channel open behind, the rostrum extending a little beyond the middle of the mesosternum. Head with five long, slender, testaceous spines; anterior pair extending to the middle of the second antennal segment; median spines extending to the end of first segment; posterior spines directed forward, curved outwardly. Bucculae minutely reticulated. Length, 4 mm.; width, 1.6 mm.

Pronotum narrowed anteriorly, somewhat greenish yellow in front, tricarinate, punctate, the punctures becoming a little larger posteriorly. Hood formed as *L. plana* Heid., but slightly higher and longer; a little depressed on the sides; nearly triangular in front. Carinae very distinct, stout parallel, more strongly raised in front, composed of a single row of small cells (in front each have three deep). Paranota mostly biseriate above (one or two extra cells on each side), formed as in *tabida* H. S., projected angularly in front. Elytra narrow, long, sides slightly rounded, extending considerably beyond the tip of the abdomen, general outline and color as in *tabida;* costal area broad, composed of four to five rows of areolae, the rows very irregularly arranged; subcostal area obliquely raised, composed of three to four rows of small areolae; discoidal area raised, bounded by a strongly raised and proiment nervure, extending considerably beyond the middle of the elytra, composed of about ten rows of cells at its widest part, the areolae impressed. Adventitious nervure of discoidal area extending from near the apex of inner margin forward to near the base of outer margin, nearly straight, fuscous. Adventitious nervure of sutural area long, fuscous slightly curved, extending from near the middle of discoidal boundary almost to the apex of elytra, with a short branch near the apex. Areolae hyaline. Nervures pale testaceous. Wings clouded, a little longer than the abdomen.

Holotype, male, *allotype,* female, Santa Rita Mountains, Arizona, Sept. 9, 1925, collected by Mr. A. A. Nichol, in my collection. *Paratypes,* collected with type, in Nichol's collection.

The broader subcostal area (3–4 cells wide) separate this species from *L. bambusae* Drake, *tabida* H. S., *simulans* Heid., and *plana* Heid. In both *L. nicholi,* n. sp., and *plana* Heid., the apex of the hood extends beyond the anterior margin of paranota; this character separates these species from *tabida* H. S., and *bambusae* Drake.

WASPS AND BEES AS WATER-STRADDLERS.

By Wm. T. Davis, Staten Island, N. Y.

The writer has on several occasions seen Hymenopterous insects alight directly on the surface of still water and drink. In the summer of 1924 I was particularly fortunate in collecting three different species which were thus engaged. At Wingina, on the James River in Virginia, on August 10, a number of bees, *Emphor bombiformis Cresson,* were alighting directly on the surface of the water of a road-side puddle near a brook. Their stay was often very brief. A few days later, namely on August 14, Colonel Wirt Robinson and I were on our way to Spear's Mountain in Buckingham Co., and were surprised to see the large reddish wasp *Polistes rubiginosus* Lepeletier, standing on the water of a ditch by the side of the road. On the water of the same ditch there were several bees, which Dr. Joseph Bequaert has determined as *Melitoma taurea* Say. These were quite shy and I had some difficulty in collecting them. *Melitoma* and *Emphor* are closely related and belong to the same family, namely the Emphoridæ. There were several places where many honey bees had congregated and were drinking water, but I saw none of them on the surface itself as in the case of the *Polistes* and *Melitoma.*

In the Proceedings, Entomological Society of Washington for 1911, p. 170, there is a note by Mr. Frederick Knab, on "How Emphor Drinks," describing a number of *bombiformis* that he saw descending directly to the surface of a pool.

In the same journal for May, 1922, p. 125, Mr. A. N. Caudell has a note on "A Diving Wasp." In this instance it was a female *Anoplius illinoiensis* Robt. that actually crawled beneath the surface of the water and about six inches along the bottom of a stagnant pool three inches deep.

Probably many more instances of this kind have been noted.

JOHN CASSIMIR WRIGHT.

From among the ranks of entomologists in Brooklyn, N. Y., there has passed away a good, faithful worker who was not a member of any society and who was unknown to most of his fellow collectors, excepting at the Brooklyn Museum, where he called frequently for assistance and advice. When a year or more ago his visits suddenly stopped, many were the inquiries concerning the tall, distinguished looking old gentleman with the long, flowing white beard whom staff members knew as Mr. Wright, interested in Lepidoptera, but of his private life no one appeared to be informed.

During November a communication was received from Miss Helen M. Wright offering as a gift to the Brooklyn Museum a collection of butterflies and moths comprising some three thousand specimens and furthermore stating that this presentation was made in grateful recognition of the service and encouragement extended to her father, the late John Cassimir Wright, who died on November 2, 1924, at the age of eighty-two. The collection, since transferred to the Museum, testifies that it has been assembled by a man of scholarly attainments and a keen observer of nature. In the greater part it contains material obtained on Long Island and very largely in the immediate vicinity of Brooklyn, but there are represented fine series of species now very rare in our local fauna. Most of these are the results of breeding.

Aside, however, from the actual value of this collection, sight should not be lost of another and a more important factor and that is how an interest in entomology has given to a man retired from professional work, a full measure of enjoyment and an intellectual and healthful occupation during the declining years of his life.

Mr. Wright, the son of English parents, was born at St. Thomas, Virgin Islands, and studied chemistry at the University of Jena, Germany. After graduation, he followed his profession at St. Thomas, at Panama, and in Santo Domingo and then entered the service of the wholesale drug firm of Lehn and Fink, New York City. At the age of seventy he retired and became interested in nature study, for which he always had an inclination, but little time during a busy career. Entomology and botany were the subjects which attracted him most. Thus out in the fields and woods or at the Museum, to name his specimens, he led an active life to which he ascribed his splendid health and his mental vigor up to the brief illness preceding his death.—Geo. P. Engelhardt, Brooklyn Museum.

LIMNOMETRA SKUSEI: A NEW NAME.

By J. R. de la Torre-Bueno, White Plains, N. Y.

Of all low things, I feel that "debaptizing" some other man's insect has an undistinguished place all alone. Yet, under the rules of nomenclature as adopted there is nothing else to do. And the law compels me.

In 1893, F. A. A. Skuse[1] described and figured *"Hydrometra australis."* Unfortunately, placing it in that genus, even though mistakenly under our current notions, it at once clashed with Say's *H. lineata* v. *australis.*[2]

Under the code of nomenclature, Skuse's name is a homonym. His species is therefore a subject for renaming.

It is obvious from the figure (and also from specimens) that the species belongs to *Limnometra.* To straighten this out, the name *Limnometra skusei* is here proposed. The synonymy therefore runs:

Limnometra skusei Bueno, n. n. = *Hydrometra australis* Skuse, 1893 (nec. Say, 1832).

Additional structural characters not given by Skuse in the description although clearly visible in the figure are:

Segment I of antennae equal to anterior tibia in length, longest, longer than II + III, and but little shorter than the total length of the other three segments. Segments II, III and IV subequal. Antennae longer than head + thorax. Posterior femur equal to entire length of bug, less genital segments; slightly longer than middle. Posterior tibia more than half as long as femur; intermediate tibia equal to intermediate femur. Anterior femur and tibia subequal to each other, the femur slightly the shorter.

---

[1] Rec. Austral. Mus. II: 42, pl. XI, f. 3.

[2] 1832. Descr. Het. Hem., 35 (Fitch reprint, 807); 1859 Complete Writings I: 361.

EDITORIAL.

Entomologica Americana.

After a lapse of thirty-six years, this veteran journal of American entomology emerges from its hibernaculum to take its place once more as a vehicle for the progress of our branch of science. Thanks to the generosity of a friend the Brooklyn Entomological Society is enabled to revive this journal to render, we hope, as good service and fill as worthy a place as its predecessor of long ago.

The Society has long felt that a medium was needed for the appearance of those longer papers—monographs and synopses of smaller groups, biological studies, morphology, embryology, revisions, and the many excellent technical productions too long and too special, perhaps, for our regular journals yet too short for a book—emanating from many workers not connected with institutions which publish the results of the research of their staffs. The opportunity has at length presented itself; and the Society has taken the positive step.

Entomologica Americana once more takes its place among our current journals.

The publication will be isued in four numbers a year, and will average approximately 50 to 60 pages to the number, or a total of 200 to 240 pages per volume. Each number will carry *one* paper; or possibly two, but not more, in view of its purpose. The annual subscription price is set at $4.00 per year. Single numbers will sell on an approximate basis of $1.50 per 50 pages; subscriptions will be received per volume—*not* for four consecutive numbers—payable strictly in advance. The edition for the first of the new volumes will be limited to 200 copies; and those intending to subscribe, particularly institutions and libraries, should do so promptly to ensure possession of complete sets.

The first number of Vol. VII (new series) is now ready. It contains a monograph on Pleuropodia of Insects, by Dr. Priscilla Butler Hussey, a study in certain embryological structures, with a complete bibliography and recension of all work on the subject to date; and eleven plates.

Authors are invited to submit contributions, bearing in mind that such contributions must be of the required length and represent original work advancing our knowledge of the taxonomy, biology, ecology, anatomy or embryology of insects. No limit is made as to illustrations, but any large number must be the subject of special discussion. Papers should be sent direct to the Editor, Entomologica Americana, 11 North Broadway, White Plains, N. Y. Subscriptions (with check) to Geo. P. Engelhardt, Treasurer, Brooklyn Entomological Society, Brooklyn Museum, Eastern Parkway, Brooklyn.

* * * *

AMONG THOSE NOT PRESENT.

Providence, R. I.,
May 8, 1926.

Brooklyn Entomological Society,
White Plains, N. Y.

Dear Sirs:

Enclosed please find money order for $1.50, my subscription for the ensuing year. I would be pleased to see a little more on Lepidoptera—so much is devoted to Hemiptera and Diptera. In all the journals there is so little written about what collectors are doing. You see no more what captures are made of Noctuids and rare species. There are Noctuids in my collection that are not named. A few good photographs of the same would help.

Very truly yours,
EDWARD D. KEITH.

This letter is well deserving of attention, albeit, entomological editors are compelled to publish what they can get and not what they would want nor what their readers would like to see. And this letter is reasonable and accurate, not alone as to this BULLETIN but as to our other American journals as well. Anyone who reads a directory of entomologists is struck at once with the preponderance in numbers of collectors and students of Lepidoptera, closely followed by coleopterists of high and low degree. But one is also struck, in reading the journals, with the absence, or rather, minimum, of articles and papers and notes on these two major groups. It might indeed seem as though the addicts to these two great orders of insects were but "mute, inglorious Miltons." None of us can gainsay their love for their chosen groups, but certainly, they are dumb about expressing it.

Now, there is, of course, a solution of brilliant simplicity! Let each lepidopterist or coleopterist who wants to know what is doing among his favorites, sit down at once, take his fountain pen in hand and forthwith write one line, many lines, a page, two pages, all that is in him, on some unfamiliar aspect or unknown fact about beetle or moth or butterfly. And let him then send it right on to some editor—to this editor, if it's *very* good—and see how soon it will be published.

Suppose each subscriber to this BULLETIN whose interest lies in Lepidoptera (there are 100 of them), wrote a note or a paper, and sent it to us! We would be well found in these for the next two years.

This is your answer, my dear Mr. Keith. Now, "go thou and do likewise."

(N. B.—There is *always* room in this BULLETIN for short notes and papers one or two pages long. Selah!)

J. R. T. B.

PROCEEDINGS OF THE SOCIETY.

MEETING OF JUNE 12, 1924.

A regular meeting of the Brooklyn Entomological Society was held at 8:25 p. m. at the Brooklyn Museum on June 12, 1924. President W. T. Davis in the chair and eight members and one visitor present.

Mr. Engelhardt read a letter from Dr. Bequaert in which there was enclosed a donation to the Society of $50.00 to help defray the expense of getting the new Glossary out. Dr. Bequaert wrote that he was leaving for South America on June 20 and expressed his regret that he had been unable to participate in any of the meetings of the Society since he had gone to Boston. On motion of Mr. Engelhardt the Society extended to Dr. Bequaert its thanks for his donation and its sincere regard and appreciation for his loyalty.

Mr. Davis showed a specimen of *Melipotis nigrescens* Grote and Robinson collected at Fort Wadsworth, Staten Island, N. Y., on June 5, 1924, the first record of this species from Staten Island; he also showed a specimen of *Calosoma willcoxi* LeConte which he found in a pail of water in his yard at 146 Stuyvesant Place, New Brighton, Staten Island, on June 2, 1924, this being the second specimen recorded from Staten Island; Mr. Davis also spoke of the great abundance of *Vanessa cardui* Linnaeus during the current spring; some of the other members confirmed Mr. Davis' observations in regard to the unusual abundance of this species. Mr. Bell reported an unusually large number of *Vanessa* *atlanta* Linnaeus observed during his collecting this spring. Mr. Torre-Bueno spoke on "Some Winter Bugs." (See this BULLETIN, Vol. XX, p. 70.) Mr. Engelhardt spoke on "Notes on Early Spring Collecting of Noctuids." (See this BULLETIN, Vol. XX, p. 61.)

MEETING OF OCTOBER 16, 1924.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, on Thursday evening, October 16, 1924, at 8:30 p. m. President W. T. Davis in the chair and eight members and one visitor present.

Mr. Doll reported the recent death of Mr. Herman Brehme, a former member of the Society.

Mr. Olsen gave a very interesting account of his experiences in the Bahamas, which he visited during the past summer on an expedition for the American Museum; he spoke of the various islands and keys which he visited, and of his collecting on the land during the short periods at his disposal, of taking photographs and moving pictures of marine life several feet under the surface, and of his work obtaining specimens of coral.

Mr. Torre-Bueno reported that the season was generally considered poor; he had a fairly successful summer in collecting Hemiptera, however. Mr. Doll reported on collecting at Mystic, Connecticut, and Green Village, N. J. Mr. Shoemaker had made some short trips; he collected in June at Shawnee on the Delaware, Penna., capturing several fine species of beetles; he collected in September, from the 19th to the 26th, at Washington, D. C., where he found the collecting to be poor; *Cychrus* were very scarce. Mr. Schaeffer reported that he did little field work, he spent several days at Yaphank, L. I., his collecting was confined mostly to sweeping and he succeeded in getting several species of *Haltica* on wild-rose, huckleberry and cat-brier, specimens of which he exhibited together with other interesting beetles, among which were two specimens of *Xylotrechus quadrimaculatus* Hald., taken by him at Flatbush, Brooklyn, N. Y., in July 1924, this being the first Long Island record for the species. Mr. Davis remarked that on October 15 at St. George, Staten Island, he had observed considerable numbers of *Erannis tiliaria* Harris, the account of which in the "Insects of New Jersey" is as follows: "The 'lime tree moth' occurs late in fall throughout the State, though hardly common; larva on basswood, elm, apple, pear, etc." Mr. Bell said that these moths were in large numbers at Flushing, L. I., at present, and that while on his way to the meeting had seen considerable numbers of them on the walls of the railroad station at Murray Hill, Flushing, and around the electric light poles in the streets; he had also seen one in the building at No. 2 Wall Street, N. Y. City, and another one on Gimbel's store on the 33rd Street side, within the past few days.

Meeting of November 13, 1924.

A regular meeting of the Brooklyn Entomological Society was held in the Brooklyn Museum on Thursday, November 13, 1924, at 8:25 p. m. President Davis in the chair and nine members present.

President W. T. Davis proposed for membership Mr. Roland Jackson Hunter, 636 High Street, Newark, N. J. On motion of Mr. Weeks the By-Laws were suspended and the Secretary cast one ballot for the election of Mr. Hunter to membership.

Mr. Torre-Bueno read from "Biology and Its Makers," Locy, 1909 (3rd edition, 1915), an account of the strange ideas which obtained in the time of Aristotle upon the origin of life, it being thought that many things came into life spontaneously from certain causes or conditions, as that frogs came into being from the mud through action of the rays of the sun; he also showed a copy from the Brooklyn Museum Library, of "Esperienze intorno alla Generazione Degl' Insetti," by Francesco Redi, 1668, which contained finely executed plates of insects and other things, and is the first work disproving the ancient theory of the spontaneous generation of life.

Mr. Doll showed specimens of *Coloradia pandora* Blake bred from pupae obtained by Mr. George P. Engelhardt in Oregon during his visit to the northwest in 1923; he also showed specimens of *Ochria buffaloensis* Grote and *Hadena diversicolor* Morrison collected by him at Green Village, N. J., and gave an account of his experiences in collecting the pupae of *buffaloensis,* which were found in a very wet location in the stalks of "lizard-tail," and in collecting them he was compelled to wade into the mud and water; he also showed specimens of *Mamestra assimilis* Morrison collected by him at Mystic, Connecticut, and one specimen of *Chytonix chlorostigma* Harvey collected by Mr. E. L. Bell at Long Mountain, New Milford, Connecticut. Dr. Hussey reported on his collecting experiences of the summer and said that he had not found the collecting to be very good.

Mr. Weeks reported on recent observations of insects at his place at Yaphank, L. I., N. Y.; he spoke of seeing yellow-jackets or "shackets" as locally called, tearing open the abdomens of honey-bee drones and feeding upon the contents while the drones were still alive.

Mr. Davis exhibited a female *Sympetrum corruptum* Hagen taken by him in Mersereau's Valley, Dongan Hills, Staten Island, September 18, 1924, and stated that the dragon-fly is usually rare in the east, but two others having been reported from the Island. He further reported that the last of the flight of the moth *Erannis tiliaria* Harris occurred about October 31 when an individual with highly contrasted markings on the fore wings was collected on Staten Island. The flight commenced about the 14th of October and appears to have been the greatest since October, 1914. Mr. Ernest L. Bell brought to this meeting a selected series of five specimens of *tiliaria* showing a considerable range of color. These with many others were collected at Flushing, L. I., October 17.

A series of the Cicadellid *Gypona octolineata* Say containing deeply colored pink individuals, as well as others partly green and pink, was shown. The rather rare beetle *Gnorimus maculosus* Knoch was again found this past summer (June 23) at St. George, Staten Island, where it has occurred in the past. It has usually been found on sidewalks or in buildings.

Mr. Davis read the note on the Dermestid beetle *Thylodrias contractus* Motschulsky (*Ignotus aenigmaticus* Slosson) from the published minutes of the Society of June 14, 1917, and showed the living colony of this museum pest kept in a glass jar for over 20 years by himself and the late Louis H. Joutel. At this season of the year the beetles are in the larval stage, but will mature next May and June.

E. L. Bell, *Secretary.*

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

BUTTERFLY COLLECTORS.—Have you aberrations or freak butterfly specimens for sale or exchange? Professional and private collectors please write. Jeane Gunder, Pasadena, Calif.

NEW ARRIVALS.—From Colombia, French Guiana, and Brazil. Brilliant tropical Lepidoptera for scientific and decorative purposes. H. S. Parish, 14 Briarcroft Road, Toronto, Ont., Canada.

ARKANSAS INSECTS.—Am again collecting. Have Lepidoptera on hand. Miss Louise Knobel, Hope, Ark.

CORRESPONDENCE INVITED from all those interested in Hungarian Insects—Coleoptera, Lepidoptera, Hymenoptera, Hemiptera, etc.—Prof. Charles Sajo, Oerszentmiklos, (Comitat Pest), Hungary.

CYNIPIDAE.—Galls and bred wasps wanted to determine or in exchange. Alfred C. Kinsey, Indiana University, Bloomington, Indiana.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

WANTED.—Pentatomidae, Cydnidae, and Scutelleridae from all parts of the United States for determination or exchange. Dayton Stoner, State University of Iowa, Iowa City, Iowa.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

WANTED.—Ants from all portions of the United States for determination or exchange. Will also exchange other insects for ants. M. R. Smith, Assistant Entomologist, State Plant Board, A. and M. College, Miss.

MISSISSIPPI INSECTS.—Will collect in all orders. Correspondence solicited. Miss Sophie May Newbern, Cedar Bluff, Miss.

ABERRATIONS
OF BUTTERFLIES
WANTED

WHEN SELLING A BUTTERFLY COLLECTION, IT IS ADVANTAGEOUS TO DISPOSE OF THESE ODDITIES SEPARATELY. THEY BRING GOOD MONEY. SEND ME A DESCRIPTION OR BETTER STILL, A SIMPLE PENCIL SKETCH OF YOUR SPECIMENS.

JEANE D. GUNDER, Pasadena, Cal.

List Nr. XIII
Gratis on Request, text English

All prices net in U. S. dollars. Contents **Lepidoptera, Coleoptera and other insects**, books, pins, etc.

Original Collection of Fassl: Heterocera (also Agrias) with many rarities, single ♀♀, types, etc.

We have the greatest store in the world of Lepidoptera, Coleoptera and other insects.

Dr. O. Staudinger & A. Bang-Haas
Blasewitz, Dresden, Germany

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147 Butterflies for trays,
192 All glass mounts,
205 North American Lepidoptera,
249 Exotic Lepidoptera,
212 Insect pests, Summary of collections,
213 Exotic Coleoptera,
214 North American Coleoptera,
234 Insect collections,
229 Life histories of insects,
254 List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
vol. 7 (new series)	4.00
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

DIV. INSECTS

XXI OCTOBER, 1926 No. 4

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

SMITHSONIAN INSTITUTION
OCT 8 1926
NATIONAL MUSEUM

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 35 cents Subscription, $1.50 per year

Mailed October 6, 1926

Entered as second-class matter January 21, 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1926

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
E. L. BELL

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
G. P. ENGELHARDT

CONTENTS

PALAEOCOLEOPTEROLOGY, Hatch 137
SUPPOSEDLY POLYGAMOUS AND CANNIBALISTIC ORTHOPTERA, Rummel 144
NOTES ON BELYTINAE, WITH N. SP. FROM NEW YORK, Fouts 145
PROPAGATION AND BEHAVIOR OF TELEA POLYPHEMUS, Rummel 156
MELITAEA HARRISI FROM L. I., Engelhardt 157
NEW PHYTOCORIS FROM EASTERN NORTH AMERICA, Knight 158
A NEW AND REMARKABLY LARGE SPECIES OF EUPAGODERES, Chittenden 169
PROCEEDINGS OF THE SOCIETY, Schaeffer and Bell 171

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXI October, 1926 No. 4

PALAEOCOLEOPTEROLOGY.

By Melville H. Hatch,[1] Ann Arbor, Mich.

Handlirsch has termed the science of the fossil Coleoptera "distinctly a discredit to palaeoentomology." For while in Coleoptera as in other insects the chief parts to be preserved are the fore wings, the venation of these parts in other insects presents taxonomic characters of the greatest value. In the beetles the fore wings are modified as elytra whose variation is of little significance in defining groups above the species. This is a fact that Handlirsch in *Die Fossilen Insekten* (1908) was among the first to emphasize, especially as applied to the Mesozoic fossils. Earlier authors, especially Heer and Scudder, determined fossils with the most specious exactness and drew the most involved conclusions, ecological and otherwise.

On the other hand, the light which palaeoentomology in the hands of Handlirsch and others has thrown on the neuropteroid and orthopteroid insects may be considered among the major achievements of palaeontology. The rise of the palaeodictyopteroids in Pennsylvanian time, their modification (1) to form the modern groups with aquatic naiads (Odonata, Ephemerida, Plecoptera), (2) through Protohemiptera to form the hemipteroids, and (3) through Protoblattoidea and Protorthoptera to form the orthopteroids and, (4) subsequent to the Permian deformation, through one or another of their derivatives to form the various groups of Heterometabola, is a fairly well established picture. Among the latter Handlirsch believes there is evidence on the basis of their comparative morphology for the derivation of Hymenoptera and Coleoptera from the protoblattoids, Lepidoptera, Diptera, etc., from the Megasecoptera, and Neuroptera from an unknown palaeodictyopteroid derivative. With more or less force it has been objected that Neuroptera and Coleoptera are more closely allied than this would indicate, though all the holometabolous affinities of the beetles are in the direction of the orthopteroid groups.

---

[1] A contribution from the Zoölogical Laboratory of the University of Michigan.

The Permian deformation was a time of rising continents, continental climates, arid deserts in the northern hemisphere, and continental glaciation in the southern hemisphere. Among the groups of organisms that failed to survive it may be mentioned the seed ferns, other primitive vascular plants, trilobites, eurypterids, Palaeodictyoptera, primitive Amphibia, primitive Reptilia. Among the more highly specialized groups that appeared in early Mesozoic or late paleozoic time may be mentioned the Glossopteris flora, higher Reptilia, perhaps the primitive Mammalia, and the Coleoptera followed later by other heterometabolous insects. It is difficult to escape the conviction that the unfavorable period of the Permian deformation—favorable for evolution—following upon the long interrupted world-wide subtropical conditions of the Palaeozoic, exerted a most potent selective force upon the development of these higher types.

With a larval stage capable of occupying a habitat distinct from that of the adult and with wing covers enabling them to combine all the advantages of a terrestrial with those of a winged animal, the Coleoptera are among the most successful and dominant groups of non-parasitic terrestrial organisms. In every period since their first appearance in the Trias, beetles constitute an important portion of the total known insects: Trias and Lias, 194 species, 25 per cent.; Dogger, Malm, Kreide, 225 species, 35 per cent.; Palaeogene 1,592 species, 37 per cent.; Neogene 937 species, 37 per cent.; Pleistocene 715 species, 54 per cent.; Recent 195,000 species, 41 per cent.

The geological record throws no light upon the phylogeny of the Coleoptera, and entire reliance must be placed in the findings of comparative morphology, so that the subject need not be treated here. Handlirsch has defined some hypothetical ancestral groups, and asserts that some of the earliest fossils may belong to them. All that the rocks reveal, however, is a series of elytra very similar to those found on many living beetles. Cockerell, for instance (1915, p. 624), points out that specimens from the English Lias possess a well-defined elytral pattern of longitudinal dark stripes quite like that seen in certain living species. Nineteen species are known from the Trias, one from the Middle Trias of central Europe, thirteen from the Upper Trias of

Europe, and five from probably the Upper Trias of Queensland (Handlirsch, 1908, pp. 398–403, Plate XXXIX), showing that beetles already had a world-wide distribution. The absence of pre-Cretaceous remains from America is noteworthy, but can probably be laid on the broad shoulders of the imperfection of the geological record.

Furthermore, the geological record throws little light on the manner in which the successive beetle faunae have been influenced by climatic or geographical conditions. The unusually small size and absence of giant forms in the beetle fauna of the European Lias or lower Jura have been attributed to temperate or subarctic conditions. Similarly, the unusually small Eocene specimens from Wyoming (Cockerell, 1920, p. 234) may perhaps be associated with the Eocene tillites of Colorado, which have been interpreted as evidence of local Alpine glaciation. Lastly the Scarborough (Ontario) forms of the last interglacial stage are most closely related to forms now inhabiting the Lake Superior and Hudson Bay regions.

Handlirsch has maintained that all the Mesozoic record reveals is the existence of certain general types, as, for instance, carabid, elaterid, buprestid, and hydrophilid, but not cerambycid, lamellicorn, curculionid, dytiscid, staphylinid or bizarre forms from the Lower Jura. From the Upper Jura carabid, hydrophilid, elaterid, buprestid, and probably cerambycid and dytiscid types are indicated, but not unquestioned Rhyncophora or Lamellicornia. There is evidence (Hatch, 1926, p. 432) to show that at least one Liassic or Lower Jurassic fossil from Switzerland may be definitely ascribed to Gyrinidae on the basis of its oval contour and the fact that its eyes in dorsal aspect do not intersect the margins of the head. This suggests that the detection of definitive characters in other specimens is not an utter improbability. In general, modern families seem to have established themselves by the end of Mesozoic time.

Critical work on Cenozoic Coleoptera remains to be done. The development of Angiosperms in the Cretaceous opened the way for species dependent upon them, and the development of mammals in the Tertiary paved the way for coprobious forms and the few species that are ectoparasitic on mammals or inhabit their nests. In general modern genera are held to have come into existence about Eocene time, whence the following among others are reported from North America: *Lebia, Harpalus, Bembidion, Platynus, Berosus, Tropisternus, Bledius, Lathrobium, Crypto-*

cephalus, Sitona. Eighty per cent. of the Tertiary genera described from North America are recent. But that much of the work must be accepted with reservations is shown by the fact that Scudder (1893, p. 6) assigned specimens to living genera when definitive characters were wanting. When such characters were present, a majority of the forms exhibited structural variations from modern forms of considerable importance.

The data for the Cenozoic fauna is summarized by Handlirsch (1920–25: 225–246, 287–288.) Its significance is largely qualitative, since the sample is too small and its geographic distribution too limited, being practically confined to Europe and North America, to warrant quantitative analysis. The absence of fossil representatives of the smaller families is entirely without significance. In general the larger living families (Curculionidae, Chrysomelidae, Carabidae, Scarabaeidae, Staphylinidae, Tenebrionidae, Elateridae, Buprestidae, Malacodermidae) are the best represented. Among these the Tenebrionidae (55 Cenozoic to 12,000 living species) are least numerous, and outside of these Hydrophilidae (63 Cenozoic to 1,555 living species) are most numerous. This last may be due to the aquatic habits of the family, though Dytiscidae (34 Cenozoic to 2,200 living species) do not exhibit a similar preponderance. The total absence of Passalidae (400 living species) and Brenthidae (900 living species) is perhaps correlated with their present restriction, with a few exceptions, to tropical regions.

The successive Cenozoic faunae exhibit an increasingly close approach to recent conditions. To the Oligocene is assigned the extensive fauna of the Baltic Amber (430 species) containing one recent species (*Tetracha carolina* L.) now known from Florida to Nicaragua. The Florissant (Colorado) fauna of Miocene or Oligocene time numbers 570 species—the richest fossil beetle fauna known. Of upper Miocene age is the Oeningen fauna of Baden—the last important pre-pleistocene beetle fauna—in which Heer detected 518 species, though only 368 are described. The faunae are alike in the abundance of Rhyncophora, which is more noticeable in North America. Florissant is further characterized by Scudder and Cockerell by the scarcity of Neotropical elements, showing that it was formed before the union of North and South America in late Miocene. It is less like the recent American fauna than is the fauna of Oenigen, and its differences as compared with the recent American fauna can mostly be accounted for by reduction, due to cooler modern conditions. Thus such plants as figs, magnolias, chestnuts, elms, and *Ailanthus* are now absent from the Rocky Mountain region.

Of Pleistocene forms 253 (95 or 41 per cent. recent) from 52 localities are known from Europe and 187 (80 or 42 per cent. recent) from 10 localities are known from North America (data for this and following from Handlirsch, Wickham and Scudder). The largest of these faunae are from Scarborough, Ont. (last interglacial) (53 species, all extinct),[2] the post glacial peat of Massachusetts (Scudder, 1894, p. 183) (60 species, only one of which is certainly extinct), Hosbach, Bavaria (lower Pleistocene) (39 species, 66 per cent. recent), and Boryslaw, Galicia (Lower Pleistocene (74 species, 24 per cent. recent). It would appear that whereas the last interglacial fauna of North America consisted entirely of species not now living, the lower Pleistocene faunae of Europe consisted in important measure (24 per cent. to 66 per cent.) of living species. The subject is in need of further investigation. All that can be said is that living species were in existence in Pleistocene time. Their genesis may lie further back still, but the 8 known Pliocene species, all extinct, are hardly numerous enough to shed any light on the problem.

Geologically speaking, the influence of civilized man on the beetle fauna is an event of the most recent occurrence. It is in general one of restriction and redistribution rather than of extermination. Through the reclamation of vast areas for agriculture and through commerce man makes it possible for a few species enormously to extend their range and increase their numbers. At the same time he causes other species to become greatly reduced in numbers and retreat to the hedge-rows and other restricted situations. It is probably but rarely that man brings about the extermination of a species, and when he effects this, he does it in one of two ways. (1) The advance of civilization or agriculture may, on a continental or island area, entirely wipe out a species or form of restricted range. (2) On oceanic islands introduced continental species may enter into such competition with native species as to exterminate them.

Summary.—The Coleoptera probably have constituted a dominant group of terrestrial animals since the beginning of Mesozoic time, and there is at present no evidence of decadency in the group as a whole. The general features of coleopterous structure have been retained nearly unaltered since the Trias. Families became established during the Mesozoic and genera have endured since the commencement of Cenozoic time. Living species came into existence in Pleistocene time. This is practically all that the geological record reveals.

---

[2] The *Gyrinus confinis* Lec. of Scudder is probably not a living species.

Problems of palaeocoleopterology.—What specimens should and what specimens should not be named remains to be determined. The binomial nomenclature overreaches itself when it pretends to name the remains of organisms whose affinities are undiscoverable or at least undiscovered. It would seem that the demands of the science would be more adequately met simply by designating a specimen as a carabid or a dytiscid or a staphylinid when nothing more than this is revealed, and by similar designations as the determination is more or less exact than this. On the other hand, cataloguers should not follow Wickham's (1920) unfortunate precedent of omitting reference to specimens to which a specific name has not been assigned.

The extensive data pertaining to fossil beetles must be reviewed by experienced coleopterists, and special studies on minor living groups and families should evaluate the geological evidence and the status of the names involved.

The geological implications of the present distribution should be considered carefully. Among recent writers attempting this may be mentioned Minck (1919) for *Oryctes,* Kleine (1921) for Brenthidae, Jeannel (1922) for Catopinae, v. Ihering (1926) for Cicindelidae, and the author (Hatch, 1926) for Gyrinidae. In its simplest form the question is whether the presence of the same genus (as *Dineutus*) in Central America and Africa or the presence of closely related genera (as *Andogyrus* and *Macrogyrus*) in South America and Australia is evidence of direct migration from one continent to the other and that, therefore, the common ancestor of the two existed at the time when the two continents may have been connected, namely in the Mesozoic. Or, on the other hand, is the present distribution the result of a dispersion from a holarctic center, which was formerly warmer than at present, an event that may have occurred as recently as Cenozoic time? In this case the subsequent extinction of the groups in the northern hemisphere must be postulated. The palaeontological evidence is weak or non-existent, and the inclination of the author is, in the absence of contrary evidence, to utilize the land-bridge hypothesis, without, however, prejudicing the issue in case land-bridges shall be shown to be geodynamically impossible ɔr dispersion from a holarctic center be definitely demonstrated.

The author is indebted to Professor E. C. Case of the University of Michigan for criticisms and suggestions.

BIBLIOGRAPHY.

The author has extracted freely from Handlirsch (1908) for many parts of his account and is indebted to Schuchert (1915) for much of the geological background. Handlirsch (1908) catalogues the known species and summarizes the palaeoentomological evidence, and summarizes it again (1920–25). Scudder (1890) and Wickham (1920) may be consulted for bibliography and Scudder (1891) for a catalogue of known species. These may be supplemented by the Zoölogical Record, the Concilium Bibliographicum (since 1897) and the Revue Critique de Paléozoölogie (since 1897). The author has a manuscript bibliography (1890–1921) of about 150 titles on fossil beetles supplementing Scudder and Wickham, which he will furnish anyone who will pay the cost of preparing a copy.

Cockerell, T. D. A.—1915. Fossil insects and evolution. Sci., n. s., 42: 624.

—— 1920. Eocene Insects from the Rocky Mountains. Proc. U. S. Nat Mus., 57: 233–260, pl. 32–36.

Handlirsch, A.—1908. Die Fossilen Insekten. Engelmann, Leipzig. pp. ix + 1430 + xl, pls. LI.

—— 1920–1925. Band III. Schröder: Handbuch der Entomologie. pp. 1–656. Fischer, Jena.

Hatch, M. H.—1926. The Phylogeny and Phylogenetic Tendencies of Gyrinidae. Pap. Mich. Acad. Sci., Arts and L., 5 (1925): 429–467.

v. Ihering, H.—1926. Zur Verbreitungsgeschichte der Cicindeliden. Ent. Mitt., 15: 156–161.

Jeannel, R.—1922. Silphidae Catopinae (Coléoptères 2^e série) avec une étude phylogenique et paléogéographique de la sous-famille. Arch. Zool. Exp., 61: 1–98.

Kleine, R.—1921. Die geographische Verbreitung der Brenthidae. Arch. f. Naturg., 87 (A): 38–132.

Minck, P.—1919. Beitrag zur Kenntnis der Dynastiden. Arch. f. Naturg., 83 (A, 1917): 37–67.

Schuchert, C.—1915. Part II. of Pirsson and Schuchert's Textbook of Geology, pp. x + 1051. New York.

Scudder, S. H.—1890. A classed and annotated bibliography of fossil insects. U. S. Geol. Sur. Bull., 69, pp. 101. Washington.

—— 1891. Index to the known fossil insects of the world including Myriapods and Arachnida. U. S. Geol. Sur. Bull. 71, pp. 734. Washington.

—— 1893. Tertiary Rhynchophorous Coleoptera of the United States. U. S. Geol. Sur. Mon. XXI, pp. vi + 206, pl. xii. Washington.

Wickham, H. F.—1920. Catalogue of the North American Coleoptera described as Fossils. Pp. 347–365 of Leng's Catalogue of the Coleoptera of America, North of Mexico, pp. x + 470.

OBSERVATIONS ON POLYGAMOUS AND SUPPOSEDLY CANNIBALISTIC INSECTS OF THE ORDER ORTHOPTERA.

By Chas. Rummel, Entomological Society, Newark, N. J.

The female of *Paratenodera sinensis* stands accused of eating its mate after being served by it in copulation. I wish to refute this old theory. If it ever did take place I would charge it to the law of self preservation. The chief function in the life of the male is to fertilize the female. This accomplished, its further existence is of no importance. The female, on the other hand, has to perform an additional duty—that of depositing its eggs.

If in this stage, the two sexes are confined in a cage without food, the male, as I will show, would be the first to weaken and fall an easy prey to the stronger female searching for a victim. As this large Mantis feeds exclusively on other insects the female, in the absence of other food, undoubtedly would turn cannibal and devour its own mate.

I secured two males and one female which I placed in a screen cage of fair size. I kept them supplied with living house flies for food. Many matings took place between the female and one or the other of the males in turn during the period of one week. After ten days the males weakened and finally died. The female survived a few days longer, laid its characteristic egg mass, resembling the cocoon of *Telea polyphemus,* and then died.

A number of the walkingstick *Diapheromera femorata,* of both sexes, were placed in a cage for the purpose of securing their eggs. It was observed that many matings took place and that this is without a doubt a polygamous insect. The specimens were taken September 22 in the adult stage and kept alive for several weeks on various kinds of foliage supplied daily. About four hundred eggs were secured from about ten females, the eggs being dropped to the bottom of the cage.

NOTES ON THE BELYTINAE WITH DESCRIPTIONS OF NEW SPECIES FROM THE STATE OF NEW YORK (HYMENOPTERA).

By Robert M. Fouts, Washington, D. C.

This paper contains descriptions of nine new species belonging to the genera *Aclista, Belyta,* and *Xenotoma.* The descriptions are based on material sent to me for identification by Mr. M. D. Leonard of Cornell University.

Genus Aclista Förster.

The following species included by Kieffer (Das Tier., Lief. 44, 1916) are herewith, upon examination of the types, referred to *Belyta: californiae* Kieff., *floridana* Ashm., *missouriensis* Ashm., and *rugosopetiolata* Ashm. *Aclista conica* Ashm. belongs to *Rhyncopsilus.*

Key to Nearctic Species (Males).

1. Anterior tibiae emarginate near apex and with a sharp projection laterally 2
Anterior tibiae not emarginate and without projection....4
2. Third antennal joint five times as long as wide. *americana* Ashm.
Third antennal joint three times as long as wide........3
3. Second tergite not striate anteriorly........*arcuata* Kieff.
Second tergite striate anteriorly..........*emarginata* Kieff.
4. Petiole rugose, short and wide..............*caudata* Harr.
Petiole not rugose, carinate or smooth..................5
5. Second abscissa of the radius absent or at the most a little longer than the marginal vein.....................6
Second abscissa of the radius at least twice as long as the marginal vein...............................8
6. Scape distinctly shorter than the second and third antennal joints united ....**palustra** Fouts.
Scape as long as or longer than the second and third antennal joints united..............................7
7. Abdomen dark reddish-brown............*nevadensis* Kieff.
Abdomen black ....*microneura* Kieff.
8. Reddish-brown, scape and legs yellow, flagellum brown *insignis* Kieff.
At least the head and thorax black...................9
9. Petiole smooth; abdomen reddish-brown; antennae dark, the three proximal joints pale yellow........*levistylus* Kieff.
Abdomen and antennae reddish-brown..*crassicornis* Harr.

Petiole carinate, abdomen black or brown-black, rarely obscurely reddish-brown anteriorly.....................10
10. First abscissa of radius oblique, as long as or shorter than the marginal vein.................................11
First abscissa of radius perpendicular, shorter than the marginal vein ....*scleroneura* Kieff.
11. First abscissa of the radius distinctly shorter than the marginal vein; petiole one and one-sixth to one and one-third times as long as wide...............................12
First abscissa of radius as long as the marginal vein; petiole scarcely longer than wide............*dolichoneura* Kieff.
12. Dorso-lateral carinae on petiole obsolescent, much less conspicuous than the median one........................13
Dorso-lateral carinae on petiole large, complete, as large as the median one ....**excavata** Fouts.
13. Carinae at base of second tergite one-half the length of the petiole ....**obliterata** Fouts.
Carinae at base of second tergite one-third the length of the petiole ....**simulans** Fouts.

Aclista palustra n. sp.

Male.—Length 2.30 mm. Width of head 1.66 times the length; head slightly wider than the thorax; scape a little longer than the third antennal joint, distinctly shorter than the second and third united; second joint oval, as wide as the scape, a little more than a third the length of the scape; third joint as wide on apical half as the scape, 3.43 times as long as wide, gradually narrowed on proximal half with the outside edge straight and with a knife-like margin; fourth joint four-fifths as long as the third, about three times as long as wide; following joints becoming gradually shorter, the thirteenth three-fifths as long as the third and a little less than three times as long as wide; last joint slightly longer than the fourth, four times as long as wide, gradually narrowed toward apex; thorax 1.61 times as long as wide, slightly higher than wide, as wide as the abdomen; marginal vein four times as long as the oblique first abscissa of the radius, about six times as long as the second abscissa of the radius (the length of a vein is the length of the inclosed chitinized tubule); cubitus indicated by a straight brownish line directed toward the basal vein; abdomen 1.22 times as long as the thorax; petiole 1.66 times as long as wide, one-third as long as the second tergite; carinae on petiole sharply indicated, straight; petiole without a median carina but with two parallel, adjacent, sub-median carinae; second tergite 3.67 times as wide as the first, 1.27 times as long as wide;

anterior tibiae not emarginate near apex and without a sharp projection laterally; black; antennae fuscous, the scape below, pedicel, and the third joint on proximal half, yellowish-brown; front and middle legs yellowish-brown, the tarsi fuscous; posterior legs somewhat darker, the trochanters and femora at extreme base, yellowish; wings brownish.

Type locality.—McLean Bogs Res., N. Y., one specimen collected July 26, 1925.

Type in Coll. Cornell University, No. 739.1.

Aclista excavata n. sp.

Male.—Length 3.35 mm. Head 1.26 times as wide as long, slightly narrower than the abdomen; scape as long and as wide as the third antennal joint; second joint as wide as long, as wide as the scape; third joint 1.20 times as long as the fourth, less than four times as long as wide; following joints becoming gradually shorter and narrower toward the apex, the thirteenth half as long as the third, three times as long as wide; last joint shorter than the fourth, tapering distally, acute at apex; flagellar joints, except the last three, distinctly, though only slightly, narrowed medially; thorax 1.56 times as long as wide, slightly higher than wide, 1.10 times as wide as the abdomen; first abscissa of the radius a little shorter than the marginal vein; cubitus indicated by a short straight brownish line directed toward the basal vein; abdomen 1.33 times as long as the thorax; petiole 1.35 times as long as wide; carinae on petiole sharply indicated, straight; petiole with a median carina; second tergite 2.62 times as wide and 2.83 times as long as the petiole, 1.43 times as long as wide; anterior tibiae not emarginate near apex and without a sharp projection laterally; black; scape and legs rufous; second antennal joint, third on basal half, posterior femora above, and posterior tibiae, reddish-brown; antennae and tibiae dark brown.

Type locality.—McLean Bogs, N. Y., July 26, 1925.

Paratype localities.—Hemlock Ridge, McLean Res., N. Y., Aug. 31, 1925; West Ridge, McLean Res., N. Y., Aug. 7, 1925.

Type and paratype in Coll. Cornell University, Nos. 740.1 and 740.2. Paratype in Coll. Fouts.

Description based on three specimens collected on the dates indicated above.

Aclista obliterata n. sp.

Male.—Length 2.41 mm. Width of head 1.31 times the length; head slightly narrower than the thorax; scape a little longer than the third antennal joint, three and two-thirds times as long as the pedicel; pedicel as wide as long, as wide as the scape; third joint one and one-half times as long as wide, 1.32 times as long as the fourth, shallowly emarginate on proximal two-fifths; fourth joint as wide as the third, less than three times as long as wide; following joints becoming gradually shorter and narrower, the thirteenth two and three-fifths times as long as wide; last joint a little longer than the fourth, three and two-fifths times as long as wide, gradually narrowed toward apex; thorax 1.44 times as long as wide, as high as wide, as wide as the abdomen; marginal vein about twice as long as the oblique first abscissa of the radius; second abscissa of the radius extremely short, continued nearly to the apex of the wing as a brownish line; intercubitus indicated by a straight brownish line directed toward the basal vein; abdomen 1.49 times as long as the thorax; petiole 1.47 times as long as wide, one-third as long as the second tergite; the only carina distinctly indicated on the petiole is the median one which is more or less effaced posteriorly; second tergite 3.40 times as wide as the first, 1.29 times as long as wide; carinae at base of second tergite half as long as the petiole; anterior tibiae not emarginate near apex and without a sharp projection laterally; black; scape, pedicel, and basal half of third antennal joint, light brown; antennae otherwise dark brown; legs brown, the anterior pair somewhat lighter, wings brownish.

Type locality.—Hemlock Ridge, McLean Res., N. Y., one specimen collected August 31, 1925.

Type in Coll. Cornell University, No. 741.1

Aclista simulans n. sp.

Male.—Length 2.65 mm. Width of head 1.33 times the length; scape a little longer than the third antennal joint, slightly less than four times as long as the pedicel; pedicel as wide as long, as wide as the scape; third joint 3.33 times as long as wide, 1.15 times as long as the fourth, shallowly emarginate on basal three-eighths; fourth joint about three times as long as wide; following joints becoming gradually shorter and narrower toward the apex; thirteenth joint three times as long as wide; last joint as long as the fourth, about four times as long as wide, gradually narrowed toward the apex; thorax 1.47 times as long as wide, as high as wide, 1.09 times as wide as the head; marginal vein 1.70 times as long as the slightly oblique first abscissa of the radius; second abscissa of the radius punctiform as in obliterata; cubitus indicated by a short straight brownish line directed toward the basal vein; abdomen 1.41 times as long as the thorax, as wide as the thorax; petiole 1.33 times as long as wide, traversed by five longitudinal carinae, the median one the largest, not obliterated toward the apex; second tergite three times as long and three and one-sixth times as wide as the petiole, 1.32 times as long as wide; carinae at base of second tergite about a third as long as the petiole; anterior tibiae not emarginate near apex and without a sharp projection laterally; color as in *obliterata.*

Type locality.—McLean Bogs, N. Y., one specimen collected July 26, 1925.

Type in Coll. Cornell University, No. 742.1.

Genus Belyta Jurine.

Belyta rugifrons n. sp.

Male.—Length 2.72 mm. Runs to *klagesi* Kieff. in Kieffer's key (Das Tier., Lief, 44, 1916, p. 391) and differs in having the radial cell slightly more than three times as long as the marginal vein. Head 1.43 times as wide as long, slightly narrower than the thorax; upper part of frons rugose; scape three times as long as wide, slightly shorter than the two following joints united, narrowed distally; third joint four times as long as the second, three times as long as wide, arcuately emarginate on basal three-eighths, the emargination not especially deep; joints four, five, and six equal, about three times as long as wide, 1.18 times as long as joint seven; last joint as long as six, four times as long as wide, acute at apex; thorax 1.42 times as long as wide, 1.20 times as wide as the abdomen, as high as the abdomen is wide; carina on propodeum divided at its middle, not elevated anteriorly; first abscissa of radius oblique, about as long as the marginal vein; abdomen 1.44 times as long as the thorax, 2.44 times as long as wide; petiole 1.56 times as long as wide, carinate but without a median carina; second tergite 1.45 times as long as wide, nearly three times as long as the first tergite; following segments united as long as the petiole; black; scape, pedicel, and half of third antennal joint reddish-yellow; antennae otherwise fuscous; legs reddish-yellow, the hind coxae basally, and the posterior tibiae entirely, darker; wings brownish.

Type locality.—Glen Echo, Maryland (May 29, 1923); paratype locality.—Hemlock Ridge, McLean Res., N. Y. (August 19, 1925).

Paratype in Coll. Cornell University, No. 743.1.
Description based on two male specimens.

Genus XENOTOMA Foerster.

The following of Ashmead's species are herewith, upon examination of the types, transferred to *Xenotoma* (*Xenotoma*): *Cinetus macrodyctium, Cinetus ruficornis, Cinetus similis, Miota rufopleuralis, Pantoclis insularis, Pantoclis megaplasta, Zelotypa borealis, Zelotypa flavipes, Zelotypa fuscicornis,* and *Zelotypa scutellata.*

The male type of *Pantoclis insularis* Ashm. belongs to the genus *Belyta.* The male type of *Xenotoma mandibularis* Ashm. belongs to *Xenotoma* but does not agree specifically with the female. The male type of *Xenotoma xanthopus* Ashm. has been lost.

KEY TO NEARCTIC SPECIES OF THE SUBGENUS *Xenotoma.*

1. Males 2
   Females 16
2. Radial cell not or scarcely longer than the marginal vein.. 3
   Radial cell at least one and one-half times as long as the marginal vein 5
3. Cubitus straight; petiole one and one-half times as long as wide .... *melanocera* Kieff.
   Cubitus curved; petiole twice as long as wide 4
4. Postmarginal vein extending past the radial cell by a little more than the latter's length; cubitus very pale. *coloradensis* Kieff.
   Postmarginal vein not extending past the radial cell. *parvicellula* Kieff.
5. Cubitus straight except often the extreme tip 6
   Cubitus curved from the base 11
6. Postmarginal vein in outer half of radial cell strongly thickened .... *laeta* Kieff.
   Postmarginal vein not at all thickened 7
7. Legs light yellow (except hind tibiae and tarsi in *flavipes*); third antennal joint deeply emarginate on basal half ...10
   Legs yellowish-red or darker; third antennal joint not or only shallowly emarginate 8
8. Third antennal joint shallowly emarginate 9
   Third antennal joint not emarginate, with a sharp straight edge on basal two-thirds .... **pilosa** Fouts.
9. Scape somewhat longer than the second and third antennal joints united .... *clinoneura* Kieff.

Scape distinctly shorter than the second and third antennal joints united .... *fuscicornis* Ashm.

10. Radial cell three times as long as the marginal vein. **kiefferi,** n. n.

Radial cell about two and one-fifth times as long as the marginal vein .... *flavipes* Ashm.

11. Thorax partly reddish-brown 12

Thorax black 13

12. Scape as long as the following two joints united; radial cell twice as long as the marginal vein .. *fungicola* Crawford.

Scape longer than the following two joints united; radial cell two and one-half times as long as the marginal vein. *rufosignata* Kieff.

13. Abdomen dark reddish-brown 14

Abdomen black; radial cell at the most three times as long as the marginal vein; veins brownish-black 15

14. Petiole two and one-half times as long as wide; radial cell nearly four times as long as the marginal vein; veins yellow .... *flavinervis* Kieff.

Petiole at the most one and one-half times as long as wide; radial cell at least three times as long as the marginal vein; veins brownish-black .... *bakeri* Kieff.

15. Antennae yellow, somewhat darker distally; thirteenth joint one and one-half times as long as wide. .*fuscinervis* Kieff.

Antennae black or brown, the two proximal joints lighter. *clarimontis* Kieff.

16. Radial cell not or scarcely longer than the marginal vein; body black .... *parvicellula* Kieff.

Radial cell at least a half longer than the marginal vein...17

17. Cubitus straight, except sometimes at tip 18

Cubitus curved from the base 25

18. Last joint of antenna three-fourths the length of the three preceding joints united, considerably wider than any other flagellar joint .... *megaplasta* Ashm.

Last joint shorter than the two preceding joints united, not wider than the fourteenth 19

19. Third antennal joint twice as long as wide 20

Third antennal joint three or more times as long as wide. .21

20. Scape as long as the three following joints united. *trisulcata* Kieff.

Scape longer than the four following joints united. **palustra** Fouts.

21. Abdomen viewed laterally curved upward at the apex....22

Abdomen straight at apex 24

22. Scape considerably shorter than the three following united 23

Scape about as long as the three following joints united. *insularis* Ashm.

23. Antennal joints ten to fourteen about as wide as long. **antennalis** Fouts.

Antennal joints ten to fourteen longer than wide. **curvicauda** Fouts.

24. Antennal joints ten to thirteen about as long as wide (last three joints lost) .... *borealis* Ashm.

All flagellar joints longer than wide .. *macrodyctium* Ashm.

25. Body rufous or reddish-brown 26

Body blackish or mostly blackish 27

26. Scape as long as the five following joints united. *castanea* Kieff.

Scape as long as the three following joints united. *xanthopus* Ashm.

27. Scape distinctly shorter than the three following united..28

Scape distinctly longer than the three following joints....29

28. Scape narrowed toward apex; scutellum dark. *mandibularis* Ashm.

Scape not narrowed toward apex; scutellum yellowish-brown .... *scutellata* Ashm.

29. Radial cell less than twice as long as the marginal vein..30

Radial cell two and one-half or more times as long as the marginal vein 33

30. Eleventh antennal joint as wide as long ...*ruficornis* Ashm.

Eleventh joint longer than wide 31

31. Antennal joints thirteen and fourteen as wide as long. *klagesi* Kieff.

Joints thirteen and fourteen distinctly longer than wide ..32

32. Petiole two and one-half times as long as wide. *similis* Ashm.

Petiole about twice as long as wide ... *fungicola* Crawford.

33. Radial cell three or more times as long as the marginal vein 35

Radial cell about two and one-half times as long as the marginal vein 34

34. All flagellar joints longer than wide ... *rufopleuralis* Ashm.

Antennal joints eight to fourteen as wide as long. *rufosignata* Kieff.

35. Abdomen dark brownish-red 36

Abdomen black .... *fuscinervis* Kieff.

36. Petiole two and one-half times as long as wide. *flavinervis* Kieff.

Petiole at the most one and one-half times as long as wide. *bakeri* Kieff.

Xenotoma (Xenotoma) kiefferi n. n.

Xenotoma (*Xenotoma*) *xanthopus* (non Ashmead, 1893) Kieffer, Ann. Soc. Sci. Brux., Vol. 33, 1909, p. 371.

Xenotoma (*Xenotoma*) *flavipes* Kieffer, Gen. Ins., Fasc. 107, 1910, p. 33.—Kieffer, Das Tier., Lief. 44, 1916, p. 539. Preoccupied by *Zelotypa flavipes* Ashm., Bull. 45, U. S. Nat. Mus., 1893, p. 365.

Type locality.—Pennsylvania.

Xenotoma (Xenotoma) pilosa n. sp.

Male.—Length 3.50 mm. Width of head one and one-half times the length; scape a little longer than the following two joints united, nearly straight, slightly narrowed distally; pedicel as wide as long; third joint four times as long as the pedicel, 1.14 times as long as the fourth joint; fourth joint four times as long as wide; following joints becoming gradually shorter and narrower; joint thirteen half as long as the scape, four times as long as wide; last joint three-fourths the length of the fourth, five times as long as wide, acute at apex; thorax distinctly narrower than the head, a little wider than the abdomen, as wide as high, 1.57 times as long as wide; radial cell twice as long as the marginal vein; first abscissa of radius oblique; second abscissa 1.60 times as long as the basal vein; metacarpa not extending past the radial cell; abdomen 1.85 times as long as wide, 1.10 times as long as the thorax; petiole a little over twice as long as wide, less than one-third as wide as the second tergite, not quite one-half the length of the second tergite, longitudinally carinate; second tergite 1.38 times as long as wide; upper part of head and thorax thickly covered with golden pubescence; hairs on rest of head, thorax, and on abdomen, silvery in color; black; antennae dark brown, the first two joints reddish-brown; legs reddish-brown, the hind tibiae medially, and the hind tarsi entirely, dark brown; wings brownish, the veins very dark.

Type locality.—Inlet Brook, McLean Res., N. Y., one specimen collected on August 31, 1925.

Type in Coll. Cornell University, No. 744.1.

Xenotoma (Xenotoma) palustra n. sp.

Female.—Length 2.93 mm. Width of head 1.30 times the length; scape a little shorter than the following five antennal joints together; all antennal joints subequal in width; pedicel as long as joint four, 1.43 times as long as wide; third joint 1.30 times as long as the fourth, twice as long as wide; joints four to nine subequal; joints ten to thirteen shorter, about as wide as long; joints thirteen and fourteen slightly wider than long; last joint conical, as long as the fourth, one and one-fourth times as long as wide; thorax as wide as the head, 1.14 times as wide as the abdomen, 1.54 times as long as wide, higher than wide; radial cell about twice as long as the marginal vein, about four times as long as wide; first abscissa of radius nearly perpendicular, about two-thirds the length of the marginal vein; second abscissa of radius 1.58 times as long as the basal vein; intercubitus indicated by a faint straight brown line directed toward the discoideus; this line a little over twice as long as the first abscissa of the radius; abdomen 1.59 times as long as the thorax, 2.80 times as long as wide; first tergite twice as long as wide, one-third the width of the second tergite, carinate, without a median carina; second tergite two and one-half times as long as the first, one and one-half times as long as wide, fluted basally, the grooves about one-third the length of the petiole; median sulcus on second tergite about as long as the petiole; black; legs rufous; antennae rufous, the apical six joints darker.

Type locality.—McLean Bogs Res., N. Y., two specimens collected August 17 and 18, 1925.

Type in Coll. Cornell University, No. 745.1; paratype in Coll. Fouts.

Xenotoma (Xenotoma) antennalis n. sp.

Female.—Length 2.50 mm. Head 1.70 times as wide as long, 1.13 times as wide as the thorax, 1.36 times as wide as the abdomen; scape distinctly shorter than joints three and four united, curved, not narrowed apically; pedicel as wide as long, as wide as the scape, wider than joint three, as wide as joint ten; joints three to ten equally wide; joints ten to fourteen wider; third joint three times as long as the second, 3.66 times as long as wide, 1.20 times as long as the fourth; fourth joint a little longer than the fifth, the latter longer than the sixth, three times as long as wide; sixth joint two and one-half times as long as wide, one and one-fourth times as long as the seventh, the latter longer than the eighth, twice as long as wide; eighth joint 1.66 times as long as wide, narrower than the ninth, one and one-fourth times as long as the ninth; joints nine to fourteen as wide as long; fourteenth joint as wide as the eighth, a little longer than wide; last joint not quite twice as long as wide, subacute at apex, half as long as the third; thorax one and one-third times as long as wide, as high as wide; first abscissa of radius oblique;

radial cell one and one-half times as long as the marginal vein; second abscissa of radius a little longer than the basal vein; intercubitus straight, as long as the marginal vein, directed toward the lower part of the basal vein; abdomen two and one-half times as long as wide, 1.56 times as long as the thorax; petiole twice as long as wide, a little over half as long as the second tergite, without distinct or complete carinae dorsally or laterally; second tergite 1.60 times as long as wide, 3.57 times as wide as the petiole, with several very short grooves on either side of the median sulcus; pubescence on body rather short, grayish in color; black; first two joints of antennae reddish-yellow; legs golden-yellow, the posterior tibiae and tarsi darker; wings hyaline, the veins dark brown.

Type locality.—McLean Bogs Res., N. Y., one specimen collected August 20, 1925.

Type in Coll. Cornell University, No. 746.1.

Xenotoma (Xenotoma) curvicaudis n. sp.

Female.—Length 3.04 mm. Head 1.44 times as wide as long, as wide as the thorax, 1.18 times as wide as the abdomen; scape slightly shorter than joints three and four united, scarcely curved, not narrowed apically; pedicel a little longer than wide, less than half as long as the third joint; third joint four times as long as wide, 1.20 times as long as the fourth joint; following joints becoming gradually shorter; all flagellar joints subequal in width; last joint one and one-half times as long as the penultimate, blunt at apex; thorax 1.41 times as long as wide, as high as wide; radial cell nearly three times as long as the marginal vein; second abscissa of radius 1.60 times as long as the basal vein; intercubitus straight, curved at tip, longer than the marginal vein, directed toward the lower part of the basal vein; abdomen two and one-half times as long as wide, a little more than one and one-half times as long as the thorax; petiole one and two-thirds times as long as wide, without distinct carinae except laterally; second tergite one and one-half times as long as wide, three times as wide and 2.77 times as long as the petiole, with a number of grooves basally, the longest of these grooves half as long as the petiole; color as in *antennalis* but the wings brownish.

Type locality.—The Hook, McLean Res., N. Y., two specimens collected August 19, 1925.

Type in Coll. Cornell University, No. 747.1; paratype in Coll. Fouts.

OBSERVATIONS ON THE PROPAGATION AND BEHAVIOR OF TELEA POLYPHEMUS.

By Chas. Rummel, Entomological Society, Newark, N. J.

One evening in June 1925 a female *Telea polyphemus* was tied out for the purpose of getting a mate. The following morning two males were found attached to it, one to each side. As the female was tied to the outside of a screen cage, this cage, without disturbing the three specimens, was taken into my room. Close examination did not disclose which one of the two males was actually in copulation with the female, but during the forenoon it was observed that one had flown to a window curtain where it was allowed to rest for the day. The other male was found to be in copulation with the female and remained so until evening when both males were given their liberty.

A few days later there were four freshly emerged females in my breeding cage. In order to keep track of them they were numbered from one to four. One, two and three were tied to the cage and left on the porch of the house. Number four was tied in a peach basket turned bottom up, and suspended from a tree at the edge of a woodland, about one thousand feet from the house. The following morning number one had no mate, but as the eggs proved to be fertile, copulation must have taken place and been completed during the night. Female number two I found mated and I numbered the male correspondingly. With female number three I found two males, one attached to each side. In this case it was easily to be seen that the one to the left was in copulation while the one to the right was merely holding on to the body of the female. I numbered the male in copulation as three and in order to prevent a mistake later on I clipped off a portion of its right forewing. The male on the right I numbered as four. The cage was taken into the room without disturbing the specimens. The female number four was not mated.

About 10 A. M. a flutter was heard from the direction of the cage and it was observed at once that male number three with the clipped wing had left the female and was resting on a window curtain a foot away. The female and male number four were engaged in a struggle, the female making strenuous efforts to get away, but the male equally determined to effect a copulation in which it succeeded in a few seconds. They were left undisturbed until evening when they separated of their own accord. During the night the three males were given their liberty.

The following morning male number three with the clipped wing was found to be mated with female number four in the peach basket. As entomologists in the past apparently have accepted the theory that these insects mate only once, it will be of interest to note the behavior of female number three and males numbers three and four. The behavior of female and male number three should establish the fact that in at least some cases more than one mating takes place on the part of both sexes. The behavior of male number four should be still more interesting as there seems to be a tendency toward reasoning power, taking in consideration the fact that this male kept its position quietly and persistently until male number three left its position, which it immediately covered.

Melitaea harrisi Scudder from Long Island, N, Y.—Although it has been a favorite collecting ground since entomological pioneer days in North America, interesting additions to the insect fauna of Long Island are still coming in.

For the spring season of 1926 we record the capture of a fine, newly emerged female specimen of *M. harrisi* taken on June 17th in a meadow bordering upon the salt water marshes of Jamaica Bay, south of Woodhaven. While asters are said to be the foodplant of this butterfly, the particular aster in this case appears to be *Doellingeria umbellata* (tall, flat-topped white aster) of which a good stand limited to this region so far has escaped the destructive encroachments of real estate developments. Ernest Shoemaker, A. C. Weeks and others who formerly devoted so much time to collecting in the vicinity of Jamaica Bay omit this butterfly in their lists of local captures. From all information available it is here recorded for the first time from Long Island.—Geo. P. Engelhardt, Brooklyn Museum.

DESCRIPTIONS OF ELEVEN NEW SPECIES OF PHYTOCORIS FROM EASTERN NORTH AMERICA (HEMIPTERA, MIRIDAE).[1]

By Harry H. Knight, Ames, Iowa.

Phytocoris borealis n. sp.

This species runs to *dimidiatus* Kirschbaum in my key (Hem. Conn., 1923, p. 630), but is distinguished by the longer antennal segment I, heavy coating of sericeous pale pubescence on dorsum, white lower half of face, and blackish ray through the pale color on propleura, as well as by the distinct male genitalia.

♂. Length 6.8 mm., width 2.3 mm. Head: width 1.17 mm., vertex .37 mm.; lower half of face white, bucculae except lower margin, spot on dorsal margin of lora, base of juga, base of tylus and indistinct mark across middle, fuscous to black; frons with oblique lines of black over paler, lower margin black; vertex with two large glabrous pale areas, separated from a large median pale spot on base of frons by a narrow blackish line. Rostrum, length 2.9 mm., extending slightly beyond posterior margins of hind coxae, pale, apex blackish. Antennae: segment I, length 1.57 mm., black, with six or seven small pale spots on dorsal aspect and one larger on middle of apical half; II, 3.32 mm., black, narrowly pale at base and a second somewhat broader pale annulus at slightly beyond middle; III, 2.3 mm., black, narrowly pale at base; IV, 1.43 mm., black. Pronotum: length 1.07 mm., width at base 1.8 mm.; black, basal margin of disk with triangular pale mark on middle and one each side near basal angle; collar more or less pale, calli marked with pale, a distinct line on basal margin and a hook-shaped pale mark on outer angles; propleura pale, dorsal margin and a ray passing through middle of coxal cleft, black. Scutellum pale, a large black mark each side on middle and joined by narrow line with median mark at base; mesoscutum black, a pale mark near each side. Sternum blackish, a white patch on each side.

Dorsum clothed with black simple pubescence and thickly intermixed with silvery white tomentum. Hemelytra black, spot at apex and on middle of corium, embolium except apically and three or four black marks, pale; clavus slightly paler along commissure and bordering scutellum. Cuneus

---

[1] Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

black, base largely and a few small spots pale. Membrane largely pale and conspurcate with numerous small and large fuscous spots and marks, areoles chiefly blackish except middle of larger one, cubitus pale. Legs black, marked with small and large pale spots, bases of femora and the coxae pale; hind femora with three or four large pale spots, the largest forming an incomplete annulus at middle of apical half. Venter largely pale, dorsal margin and basal half of genital segment blackish. Genital segment without tubercles near base of claspers, the right clasper shaped much like that of *corticevivens* Kngt. and *fumatus* Reut., but the lack of tubercles will distinguish this species.

♀. Length 6.7 mm., width 2.4 mm. Head: width 1.18 mm., vertex .44 mm. Antennae: segment I, length 1.73 mm.; II, 3.43 mm.; III, 2.3 mm.; IV, 1.5 mm. Pronotum: length 1.03 mm., width at base 1.8 mm. Very similar to the male in pubescence and coloration, but dorsum more broadly pale; disk of pronotum and hemelytra with additional pale spots appearing.

Holotype: ♂, August 6, 1918, Gull Lake, Ontario, Canada (H. S. Parish); author's collection. *Allotype:* August 2, 1889, Jamestown, New York (E. P. Van Duzee); Iowa State College Collection. *Paratype:* ♂, same data as the type.

Phytocoris albifacies n. sp.

This species runs to *davisi* Kngt., in my key (Hem. Conn., 1923, p. 616) but is distinguished by the black propleura having lower margin only white, and frons with dark lines.

♂. Length 5.9 mm., width 2.3 mm. Head: width 1.11 mm., vertex .46 mm.; lower half of face or beneath a line running through base of tylus and lower margin of eyes, white, black above this line, the vertex more or less pale and with fuscous, a curved white mark against inner margin of each eye. Rostrum, length 3.43 mm., attaining base of ovipositor, white, segments III and IV blackish. Antennae: segment I, length 1.8 mm., black, dorsal aspect with two glabrous white spots on apical half and four or five smaller spots on basal half, spines short, length scarcely equal to thickness of segment, both fuscous and pale; II, 3.3 mm., black, pale at base for a space of .23 mm., and a pale annulus of equal width beginning at middle; III, 1.77 mm., black, pale at base; IV, 1.31 mm., black. Pronotum: length 1.06 mm., width at base 1.69 mm.; black, lower margin of propleura, xyphus, and collar to a point behind lower margin of eye, white; dorsal aspect of collar and between calli more or less pale and marked with reddish, calli with small paler maculae, central area of disk more fuscous, basal margin somewhat pale, with two black callous spots each side of median line. Scutellum fuscous to blackish, basal angles and apex pale.

Hemelytra blackish, several small spots on embolium, base of cuneus, a triangular spot at apex of corium and spot near middle, paler. Membrane brownish black, having paler areas sprinkled with fuscous dots, cubitus largely pale. Sternum and pleura black, margins bordering coxae pale. Venter black, pale beneath except on last genital segment. Legs black and marked with pale much as in *corticevivens*; femora black, irrorate with pale, a somewhat larger spot indicating an oblique subapical annulus. Dorsum clothed with rather short, black, simple pubescence and intermixed with silvery and golden sericeous pubescence.

♂. Length 6 mm., width 2 mm. Head: width 1.08 mm., vertex .40 mm. Antennae broken. Pronotum: length 1.1 mm., width at base 1.7 mm. Very similar to the female in coloration although more strongly black. Genital claspers distinctive (fig. 1); indicating a close relationship to *corticevivens* Kngt.

Holotype: ♀, June 17, 1913, Agricultural College, Mississippi (T. F. McGehee); author's collection. *Allotype:* ♀, June 11, 1912, Agricultural College, Miss. (T. F. McGehee), taken on pecan. *Paratype:* ♀, June 17, 1912, Agricultural College, Miss. (W. E. Dove).

No doubt this species will be found to frequent the bark of pecan and perhaps of other trees since it is of the bark inhabiting type.

Phytocoris oppositus n. sp.

Allied to *lineatus* Reuter, but distinguished by the long antennal segment I (1.45 mm.) which exceeds (♀) the length of head and pronotum taken together (1.28 mm.). While the female of *lineatus* is unknown, the distribution of that species would seem to indicate something different.

♀. Length 4.5 mm., width 1.4 mm. Head: width .77 mm., vertex .43 mm., clypeus prominent, vertical, separated from the frons by a rather broad but deep depression; vertex and frons distinctly flattened, pale, a reddish brown line each side of middle which join just before apex of frons and continuing as a single median line on clypeus, also a transverse reddish mark across middle of clypeus, and a narrow reddish line on dorsal margin of lora; a fuscous mark behind lower margin of eye which continues back on propleura, across lower margin of coxal cleft, broadening somewhat to take in lower one-third of propleura and extending upon sides of sternum. Rostrum, length 2.5 mm., extending upon fifth ventral segment, pale, apical segment blackish. Antennae: segment I, length 1.45 mm., cylindrical or only a trifle thicker near base, reddish brown, dorsal surface pale, margins of pale stripe somewhat irregular, inner and dorsal surface set with several pale setae of which the longest do not exceed thickness of segment; II, 2.6 mm., reddish brown to fuscous, a pale band near base just beyond the narrow brown basal ring, a second and broader pale portion beginning at middle and extending for a distance nearly equal to one-fourth the length of segment: III, 1.51 mm., brownish, paler at base; IV, broken. Pronotum: length .57 mm., width at base .94 mm.; disk much flattened, about on a level with vertex and scutellum; reddish to fuscous, median line, a broader one each side, lateral and basal margins of disk, paler, a blackish spot each side of median line on base of disk; propleura fusco-reddish, a longitudinal pale stripe on middle, bordered above by a slender fuscous line that marks off the pale margin of disk. Scutellum reddish to fuscous, apical half pale but with fuscous mark each side of median line. Hemelytra brachypterous, flattened, embolar margins strongly arcuate, cuneus deflexed, rounded, reaching upon seventh abdominal segment, membrane absent; pale and darkened with fuscous, embolium, outer margin of cuneus, and inner half of clavus, pale, apex of clavus set with a dense group of black hairs.

Dorsum sparsely set with short, rather stiff fuscous or black hairs, intermixed with more closely appressed, pale sericeous pubescence; head and dorsal part of collar set with pale to yellowish hairs. Legs pale, front femora with a heavy, fusco-reddish, longitudinal line on posterior aspect, the anterior aspect with a similar mark on apical half, while the dorsal surface has a more slender and sometimes interrupted line on apical half; intermediate femora marked much like the preceding but the dark lines more confused apically; hind femora blackish except near base, anterior aspect with a rather slender, slightly oblique white line which connects dorsally with a corresponding, although interrupted white mark on posterior aspect; tibiae pale, a reddish mark beneath knee, apices of anterior pair rather broadly fuscous while two other reddish bands are indicated on ventral surface. Venter pale, irregularly darkened with hypodermal red, genital segments darker, the impressed lateral line bordered with fuscous.

Holotype: ♀, June 26, 1921, Aberdeen, Mississippi (C. J. Drake); author's collection.

Phytocoris schotti n. sp.

In my key to the species of *Phytocoris* (Hem. Conn., 1923, p. 632) this species runs to *obtectus* Kngt., but is readily distinguished by the pale bucculae, slight depression at base of tylus, reddish coloration on outer margin of cuneus, and structure of the male genital claspers.

> ♂. Length 5.2 mm., width 1.9 mm. Head: width 1 mm., vertex .26 mm., frons with five or six oblique reddish lines each side of median line; base of tylus and spot each side on basal half, dorsal margins of juga and lora, and slender median line on apical half of tylus, reddish. Rostrum, length 2.34 mm., extending upon fifth ventral segment. Antennae: segment I, length .97 mm., brownish black, with several small glabrous white spots on dorsal aspect, spines pale; II, 2.3 mm., black, narrowly pale at base; III, 1.23 mm., black, pale at base and on extreme tip; IV, .91 mm., blackish. Pronotum length .84 mm., width at base 1.5 mm., propleura blackish, lower margin and a spot at top of coxal cleft, white; the white lower margin continued as a ray upon the black sternum.
>
> Coloration suggestive of *salicis* Kngt., but the dark color more blackish; apical half of corium largely pale except near inner margin, without oblique infuscation; cuneus largely pale, apex and two spots on inner margin black, outer margin marked with red. Membrane marbled with fuscous, areoles chiefly dark fuscous, margined apically by white veins. Legs marked much like *eximius,* the blackish color on femora irregularly broken by two or three large and many small white spots. Clothed with fuscous to black simple pubescence and intermixed with white, sericeous pubescence, the hairs on head and embolium more pale than dark. Genital claspers distinctive (fig. 1) of the species.

Holotype: ♂, July 5, 1923, Bound Brook, New Jersey (F. M. Schott); author's collection.

Phytocoris albitylus n. sp.

Allied to *husseyi* Kngt., and seems to run best to that species in my key (Hem. Conn., 1923, p. 631), but distinguished by the large eyes and shorter antennal segment I which in length only equals width of head; also differs in the white tylus and much reduced genae.

♂. Length 5.7 mm., width 2.1 mm. Head: width 1.08 mm., vertex .26 mm.; eyes very large thus reducing width of gena to a point about equal to thickness of antennal segment II; white, a few fine lines on frons and one across base of juga, fuscous; lora blackish, ventral margin and apex pale, tylus white except for a slender transverse dark line on apex. Rostrum, length 2.4 mm., reaching middle of venter, pale, apex blackish. Antennae: segment I, length 1.08 mm.; II, 2.46 mm.; III, 1.26 mm.; IV, missing; coloration similar to *husseyi* except segment I is more broadly white, the spots largely confluent. Pronotum: length 2.4 mm.

Dorsum clothed with pubescence and in coloration very similar to *husseyi*. Legs colored much as in *husseyi* but hind femora with very large white areas, the dark marks reduced to the vanishing point except near apex. Genital claspers indicate a close relationship with *husseyi* but the right clasper is shorter, more sinuate, and sharply curved at apex.

Holotype: ♂, March 17, 1921, Dunedin, Florida (W. S. Blatchley); author's collection.

Phytocoris exemplus n. sp.

Allied to *buenoi* Kngt., but distinguished by the narrow vertex, smaller size, and by the tubercle above base of left genital clasper.

♂. Length 4.6 mm., width 1.7 mm. Head: width .97 mm., vertex .257 mm.; width of vertex much less than dorsal width of an eye. Rostrum, length 2.3 mm., extending upon base of eighth ventral segment. Antennae: segment I, length .84 mm., apex and three or four spots on dorsal aspect, white; II, 2.1 mm., black, pale at base; III, 1.2 mm., black, pale at base; IV, .94 mm., black. Pronotum: length .81 mm., width at base 1.43 mm. Coloration and pubescence very similar to that of *buenoi* Kngt., but the heavy fuscous mark on apical field of corium is here more triangular, its posterior margin nearly transverse. Membrane nearly pale, areoles fusco-brownish, veins white on apex. Hind femora largely white on ventral aspect, the white spots closely grouped and leaving only a reticulation of fuscous. Genital claspers very similar to *buenoi* Kngt., but a tubercle above base of left clasper will distinguish this species at once.

Holotype: ♂, June 16, 1917, Colyell, Louisiana (H. H. Knight); author's collection; collected on cypress (*Taxodium distichum*).

Phytocoris angustifrons n. sp.

Runs to *pinicola* Kngt. in my key (Hem. Conn., 1923, p. 641) but distinguished from that species by the large eyes and narrow vertex; genital claspers very similar to those of *diversus* Kngt. but otherwise very different. Pubescence much as in *pinicola* but with brownish to fuscous simple pubescent hairs and more thickly intermixed with whitish sericeous pubescence.

> ♂. Length 5.1 mm., width 1.7 mm. Head: width 1.13 mm., vertex .31 mm.; yellowish, with reddish marks on vertex, frons, and dorsal margin and base of lora. Rostrum, length 2.1 mm., extending slightly beyond posterior margins of hind coxae. Antennae: segment I, length .66 mm., marked nearly as in *pinicola*; II, 2.26 mm., fusco-brownish, narrow base paler; III, 1.28 mm., black, narrowly pale at base; IV, .97 mm., blackish. Pronotum: length .82 mm., width at base 1.5 mm.; yellowish to dusky, darker near base but narrow basal margin pale. Hemelytra somewhat paler than in *pinicola,* outer margin of cuneus with three or four dark points. Legs much as in *pinicola* but coxae and basal half of femora paler; dorsal margin of hind tibiae with white line, not broken into spots as in *pinicola.* Genitalia distinctive, the claspers very similar to those of *diversus;* flagellum with nine teeth in the comb.
>
> ♀. Length 4.8 mm., width 1.6 mm. Head: width 1.06 mm., vertex .41 mm. Antennae: segment I, length .66 mm.; II, 2.1 mm.; III, 1.18 mm.; IV, 1 mm. Pronotum: length .77 mm., width at base 1.36 mm. Very similar to the male in pubescence and coloration.

Holotype: ♂, April 1, 1921, Dunedin, Florida (W. S. Blatchley); author's collection. *Allotype:* ♀, June 16, 1917, Colyell, Louisiana (H. H. Knight). *Paratypes:* ♂ ♀, Aug. 4, Ocean Springs, ♀, June 25, 1921, Aberdeen, Mississippi (C. J. Drake).

Phytocoris signatipes n. sp.

Allied to *angustifrons* but differs in the reddish coloration of scutellum, apical area of corium, and apex of cuneus; hind femora brownish black and mottled with large and small coalescing white spots.

> ♂. Length 4.4 mm., width 1.7 mm. Head: width .98 mm., vertex .31 mm.; pale and marked with red, vertex, transverse lines on frons, bases of juga, of lora and of bucculae, sides of tylus except apically, reddish. Rostrum,

length 1.8 mm., extending upon fifth ventral segment, yellowish, apex blackish, a red line on side of first segment. Antennae: segment I, length .54 mm., dark red, with several glabrous white spots, spines pale to fuscous; II, 1.86 mm., black, narrowly pale at base; III, .97 mm., black, narrowly pale at base; IV, .77 mm., black. Pronotum: length. 73 mm., width at base 1.33 mm.; pale to dark reddish brown, basal margin narrowly pale but irregularly bordered on discal side with reddish brown, calli and central area of disk chiefly pale. Scutellum dark reddish, slender median line and broad apex pale.

Simple pubescence pale on head and collar, fuscous on pronotum, and brownish on hemelytra; intermixed on dorsum with white sericeous pubescence. Hemelytra varied with pale, fuscous, and reddish; clavus fusco-brownish, commissure narrowly margined with white; embolium pale, marked with dark reddish; corium fusco-brownish, a spot near base and an oblique mark on middle, pale, apical field reddish, but apex and joining with basal angle of cuneus, pale; apical half of cuneus and two spots on outer margin near base, reddish, with two black points on membrane margin near base. Membrane and veins fusco-brownish, scarcely paler at apex of cuneus, cubitus white at apex of larger areole. Sternum and venter reddish to dark brown. Femora reddish brown, darker on hind pair, closely spotted with small and coalescing white marks; hind femora with several large white spots, ventral aspect appearing largely white and spotted with irregular dark marks, the spines and hairs pale. Tibiae dark brown, varied with white spots and areas, spines pale brownish. Genital claspers (fig. 1) distinctive, although exhibiting a close relationship with *conspersipes* Reut. and *angustifrons* Kngt.

Holotype: ♂, Sept. 25, 1911, Silver Springs, Florida (Geo. P. Engelhardt); author's collection.

Phytocoris taxodii n. sp.

Allied to *rufus* Van D., but differs in the longer rostrum which extends upon base of male genital segment, also differs in the longer antennal segment I, and in the structure of the male genital claspers.

♂. Length 5.1 mm., width 1.7 mm. Head: width .94 mm., vertex .26 mm.; yellowish, sometimes tinged with red. Rostrum, length 2.5 mm., attaining base of genital segment. Antennae: segment I, length 1.03 mm., slightly thicker at base and apex, a few weak yellowish setae on basal half, yellow to reddish; II, 2.34 mm., yellowish; III, 1.3 mm., yellowish to dusky; IV, 1.05 mm., dusky, yellowish pubescent. Pronotum; length .80 mm., width at base 1.4 mm.; reddish, becoming fusco-reddish near base of disk, narrow basal margin and median line on collar and between calli, paler. Scutellum yellowish or tinged with reddish. Hemelytra yellowish to reddish much as in *rufus* Van D., inner apical angles of corium becoming infuscated but not extending forward along radial vein across middle of corium as in *rufus*; cuneus roseate red but narrow outer margin yellow; membrane fusco-brownish, veins strongly red. Ventral surface and legs yellowish; hind femora reddish except basal one-third, irrorate with small yellowish spots; base of hind tibiae more or less reddish. Genital claspers distinctive, basal half of right clasper much more slender than in *rufus* Van D.

Clothed with golden yellow simple pubescence, but becoming fuscous on pronotal disk, and intermixed on dorsum with more closely appressed, sericeous, silvery white pubescence.

♀. Length 5.3 mm., width 1.8 mm. Head: width .91 mm., vertex .34 mm. Rostrum, length 2.6 mm., reaching upon base of ovipositor. Antennae: segment I, length 1.10 mm.; II, 2.4 mm.; III, 1.31 mm.; IV, 1.03 mm. Pronotum: length .85 mm., width at base 1.49 mm. Very similar to the male in pubescence and coloration.

Holotype: ♂, June 16, 1917, Colyell, Louisiana (H. H. Knight); author's collection. *Allotype:* same data as the type. *Paratypes:* GEORGIA—♂ ♀, June 28, 1912, Okefenokee Swamp (J. C. Bradley); Cornell University collection. LOUISIANA—16 ♂ ♀, taken with the types; 2 ♂, 1 ♀, June 18, 1917, Shriever (H. H. Knight); taken on cypress (*Taxodium distichum*). MISSISSIPPI—10 ♂ ♀, July 15, Durant; 5 ♂ ♀, July 27, Natchez; 2 ♀, June 18, 1921, Vicksburg (C. J. Drake). This species was found breeding on bald cypress (*Taxodium distichum*) by Dr. C. J. Drake and by the writer.

Phytocoris rubellus n. sp.

This species runs to *puella* (♂) in my key (Hem. Conn., 1923, p. 644), but is distinguished by the shorter antennal segment I which is not equal to width of head plus width of vertex.

♂. Length 4.8 mm., width 1.54 mm. Head: width .86 mm., vertex .25 mm. Rostrum, length 1.94 mm., extending slightly beyond hind coxae or upon base of fourth ventral segment, pale to yellowish, apex blackish. Antennae: segment I, length .81 mm., reddish, with three or four large glabrous white spots and about the same number of small ones, set with six or eight pale bristles, some of which in length exceed thickness of segment; II, 2.1 mm., yellowish, sometimes tinged with red, apex dusky; III, 1.06 mm., yellowish, becoming dusky apically; IV, 1 mm., fuscous. Pronotum: length .71 mm., width at base 1.28 mm.; reddish to fuscous, median line and extending upon vertex, and frequently one each side on pronotal disk, pale. Scutellum reddish, basal angles and apex pale. Hemelytra reddish to fuscous, embolium with several obsolete pale marks. Cuneus reddish, scarcely darker at apex. Membrane pale fuscous, marbled with paler, veins fuscous although pale to reddish at apex of areoles. Legs pale yellowish to reddish and marked with paler irrorations, exhibiting more red than in *puella*. Clothed with pale to fuscous simple pubescence and intermixed with white sericeous pubescence, the latter tending to form in spots on hemelytra.

♀. Length 4.8 mm., width 1.63 mm. Head: width .86 mm., vertex .37 mm. Antennae: segment I, length .88 mm.; II, 2.06 mm.; III, 1.08 mm.; IV, .95 mm. Pronotum: length .77 mm., width at base 1.37 mm. Coloration usually of a deeper red than in the male, hemelytra uniformly red without fuscous.

Holotype: ♂, August 22, 1921, Brookings, South Dakota (H. C. Severin); author's collection. *Allotype:* same data as the type. *Paratypes:* IOWA—2♂ 2♀, Sept. 22, 3♂ 1♀, Oct. 13, 1896, ♂, July 12, ♀, July 21, 1897 (E. D. Ball). 2♂ 7♀, July 19, 1925, Ledges State Park (H. H. Knight), found breeding on *Salix longifolia,* nymphs and teneral adults taken. INDIANA—♀, Aug. 26, 1904, Laporte County (W. S. Blatchley). MISSOURI—♀, June 29, Kansas City (F. Rogers). KANSAS—3♂ 2♀, Sept. 23, Riley County (E. E. Faville). SOUTH DAKOTA—6♂ 2♀, taken with types. ♀, July 26, 1921, ♀, Sept. 9, 1920, Brookings; ♀, Sept. 20, 1920, Ft. Pierre; ♀, Oct. 22, 1919, Yankton (H. C. Severin).

Phytocoris balli n. sp.

This species runs in group I of my key (Hem. Conn., 1923, p. 615) and traces as far as couplet 13, where it differs from both species by the black antennal segment II being pale only at base, by the large eyes and narrow vertex; also antennal segment I is not equal to width of head, and the scutellum has a clearly defined median pale line.

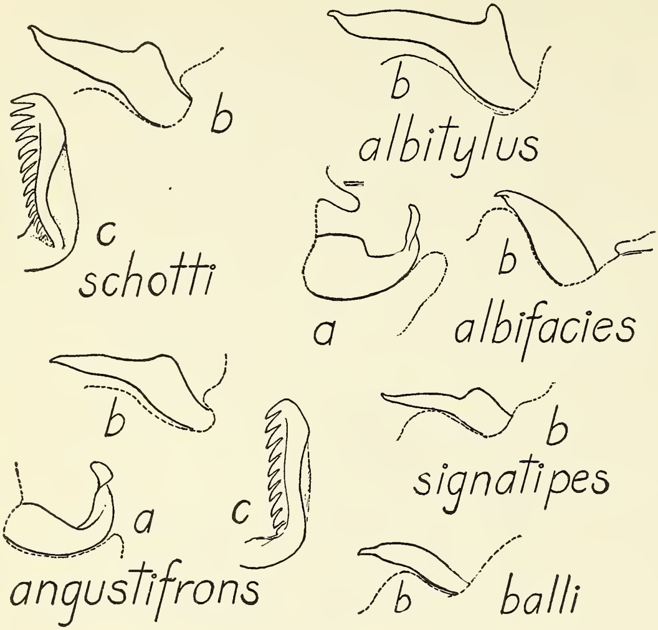


Fig. 1. Male Genitalia of Species of *Phytocoris*. *a.* Left clasper, lateral aspect, with partial outline of genital segment in dotted line. *b.* right clasper, lateral aspect, outline of genital segment added. *c.* flagellum.

♂. Length 5.3 mm., width 1.8 mm. Head: width 1.03 mm., vertex .21 mm.; eyes extremely large, greatly reducing width of vertex and size of genae; frons marked with transverse black lines, tylus with a large mark on each side and bivittate mark at base, and base of juga and of lora, black. Rostrum, length 2.3 mm., reaching upon sixth ventral segment. Antennae: segment I, length .91 mm., pale beneath, blackish above and marked with several small white spots; II, 2.43 mm., black, narrowly pale at base. Pronotum: length .83 mm., width at base 1.43 mm.

Coloration and pubescence suggestive of *eximius* Reut., but the dark areas of membrane broken into spots and reticulations; veins pale to white except the one separating areoles which is black. Scutellum with median line pale, a rounded black spot on each lateral margin at slightly behind middle. Genital claspers distinctive (fig. 1).

Holotype: ♂, April 15, 1926, St. Augustine, Florida (E. D. Ball); author's collection.

A NEW AND REMARKABLY LARGE SPECIES OF EUPAGODERES.

By F. H. Chittenden, Bureau of Entomology,
Washington, D. C.

Through the kindness of Mr. Roy E. Campbell, the writer is enabled to present a description of a species of *Eupagoderes* found in an onion field in southern California. It is evidently new to science and is apparently the largest species known in our fauna.

Eupagoderes giganteus n. sp.

> Elongate ovate, a little more than twice as long as wide, strongly convex, black, prothoracic scales forming a trivittate pattern, varying from plumbeous gray to blackish; surface of entire body densely covered with very minute, whitish gray scales. Setae short, fine, white. Rostrum longer than head; median sulcus distinctly impressed, lateral sulci about one-half as long, surface finely, sparsely punctate. Mandibles black, large and strong, widely separated, not very irregular in form. First funicular joint as long as 2 and 3 together, remaining ones subequal in length. Prothorax slightly transverse, moderately arcuate at the sides, subtruncate and not elevated at apex on the dorsum, median sulcus narrow, short; base with strong plica each side; surface sparsely, moderately strongly and irregularly punctate on disc, coarsely at sides, but not rugulose. Scutellum small, partially concealed. Elytra oblong ovate, a little more than three times as long as prothorax, variable but about as wide as long; striae wide and shallow with punctures coarse, rounded, moderately deep, remotely placed and of irregular size; intervals distinctly convex, subuniform in width, sixth interval widest. Femora and tibiae nearly as in *desertus*, but distinctly more robust. Ventral surface pale gray, with long gray setiform hairs. Ventral segments about as in *desertus* but more densely scaly and hairy like the legs.
>
> Length ♀, 19.0 to 22.0 mm.; width 8.5 to 10.0 mm.; length of rostrum and head 5.5 mm.

Coachella, Calif., March 18, 1918 (H. J. Ryan); observed in an onion field on the stalks of onion but no definite injury noticed.

Type ♀—Cat. No. 27476, U. S. National Museum. Three females.

This species somewhat resembles *desertus,* but is more convex, the rostrum is not so deeply sulcate at the middle, the apex of the prothorax is not wide and elevated, is not divided from the disc, and its entire surface is much less coarsely punctate; the elytral striae are more finely and deeply punctate, and the nearly obscured scutellum appears to be a specific character. It seems probable from the series examined that this is the largest species occurring in America north of Mexico.

One specimen is paler on the dorsum and much paler on the ventral surface. The prothorax is apparently paler and trivittate as in the normal form, but this is seen to be due to shadow, even under a 10-power magnification, and the intervals are plainly pale ochraceous.

On the right side of the type there is a dehiscent mandibular appendage, a little more than one-third the length of the rostrum, measuring 2 mm.

It might be added that this species, although resembling somewhat the male of *E. prolatus* figured by Champion (Biol. Centr.-Amer., Col., Vol. IV, Pt. 3, p. 94, tab. IV, fig. 9), is quite distinct, although of the same dimensions. The scutellum, as described and figured, alone would preclude the possibility of the two species being identical and the rostrum, as described, is not provided with "three deep elongate grooves."

PROCEEDINGS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY

MEETING OF JANUARY 16, 1925.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, January 16, at 8:15 p. m. President William T. Davis in the chair; eight members present and ten visitors.

Mr. John M. Sheridan, 84 Amity Street, Brooklyn, N. Y., was proposed as an active member of the Society. On motion the by-laws were suspended and the secretary was instructed to cast the ballot of the Society for Mr. Sheridan as a member.

The treasurer read a letter from the secretary of the Zoological Society of London acknowledging the receipt of five pounds (£5), also their best thanks for this donation to the publication fund of the Zoological Record.

The nomination committee proposed the following members to serve as officers of the Society for the year 1925:

President:	William T. Davis
Vice-President:	J. R. de la Torre-Bueno
Recording Secretary:	Ernest L. Bell
Corresponding Secretary:	Howard Notman
Treasurer:	George P. Engelhardt
Librarian:	Elmer McDevitt
Curator:	A. C. Weeks

Publication Committee: J. R. de la Torre-Bueno, George P. Engelhardt and the secretary.

As there were no other nominations the gentlemen were duly elected.

Mr. Weeks spoke of his visit to Mr. Martin, an old member of the Society who is very feeble and unable to attend meetings, and said that he was always very glad to see some of the members.

Mr. Davis exhibited eighteen specimens of *Podops cinctipes* which he found very commonly on the evening of August 30, 1924, on the cat-tail rushes (*Typha*) at the edge of the salt marsh at Old Place, Staten Island. It is also found more inland.

Mr. R. J. Hunter then gave a very interesting account of his trip to New Zealand which was illustrated by a number of photographs and picture postals.

In connection with Mr. Hunter's paper Mr. Engelhardt showed a pair of *Oenetus virescens* and *Oenetus rubroviridans,* two peculiar wood-boring moths from New Zealand.

After discussion by several members, the meeting adjourned.

CHAS. SCHAEFFER, *Secy. pro. tem.*

The February meeting, on account of the holiday on February 12th, was postponed to February 19th, but no regular business could be transacted on account of having no quorum. However, Mr. Wm. T. Davis gave an informal and interesting account of the Orthoptera collected on several trips to Wingina, Va., by himself and Colonel Robinson. Specimens of all the species taken were exhibited. His notes and observations of the Orthoptera of this interesting region will be published.

MEETING OF MARCH 12, 1925.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, on March 12, 1925, at 8:00 p. m. President W. T. Davis in the chair and twelve members present, also six visitors, including Mr. Arthur H. Helme, naturalist.

Mr. Davis announced that Mr. Notman did not wish to represent the Society at the Academy, and that he appointed Mr. Geo. P. Engelhardt in his place.

Mr. Engelhardt then addressed the Society on the subject of "Caves and Cave Life in Kentucky and Tennessee." He briefly outlined the principal cave districts in Kentucky, all of which are located in a sort of table land composed of very massive, subcarboniferous limestone, overlaid in many places by a thin stratum of sandstone, the whole area comprising about 8000 square miles, overlapping in the North into Indiana and in the South into Tennessee. Aside from the three principal rivers—the Green, Nolan and Barren Rivers which run through deep gorges, there are very few brooks and small streams, but in their place there are many more or less circular depressions, called sinkholes, connecting with fissures in the limestone rock. Entering through these fissures, the surface drainage in a course of time, variously estimated at from one to two million years, has carved out all of the wonderful subterranean channels and caverns for which Kentucky is famous. There may be other caves as beautiful and with chambers as large or larger, but there is no region in the world where cave formations have been so extensive. Hundreds of miles of subterranean avenues already have been explored, but there are still thousands of miles which have never been entered.

(*Continued in December*)

ABERRATIONS
OF BUTTERFLIES
WANTED

WHEN SELLING A BUTTERFLY COLLECTION, IT IS ADVANTAGEOUS TO DISPOSE OF THESE ODDITIES SEPARATELY. THEY BRING GOOD MONEY. SEND ME A DESCRIPTION OR BETTER STILL, A SIMPLE PENCIL SKETCH OF YOUR SPECIMENS.

JEANE D. GUNDER, Pasadena, Cal.

COMSTOCK'S

Introduction to Entomology

The complete work includes Part I as issued in 1920, *revised* and Part II, devoted to the classification and the life histories of insects.

$6.00 Net

About 1044 pages
1228 Illustrations
Buckram Cloth Binding

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

List Nr. XIII
Gratis on Request, text English

All prices net in U. S. dollars. Contents **Lepidoptera, Coleoptera and other insects,** books, pins, etc.

Original Collection of Fassl: Heterocera (also Agrias) with many rarities, single ♀ ♀, types, etc.

We have the greatest store in the world of Lepidoptera, Coleoptera and other insects.

Dr. O. Staudinger & A. Bang-Haas
Blasewitz, Dresden, Germany

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147	Butterflies for trays,
192	All glass mounts,
205	North American Lepidoptera,
249	Exotic Lepidoptera,
212	Insect pests, Summary of collections,
213	Exotic Coleoptera,
214	North American Coleoptera,
234	Insect collections,
229	Life histories of insects,
254	List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
vol. 7 (new series)	4.00
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

XXI DECEMBER, 1926 No. 5

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

SMITHSONIAN INSTITUTION
DEC 20 1926
NATIONAL MUSEUM

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 35 cents Subscription, $1.50 per year

Mailed December 14, 1926

Entered as second-class matter January 21, 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1926

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
E. L. BELL

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
G. P. ENGELHARDT

CONTENTS

DESCRIPTIONS OF NORTH AMERICAN SPECIES OF PRISTAULACUS KIEFFER (HYMENOPTERA–AULACIDAE), Bradley 173
A NEW SPECIES OF SAPROMYZIDAE FROM CHINA (DIPTERA), Malloch 176
REMARKS ON THE LINNEAN SPECIES OF NEPA AND LACCOTREPHES (HEMIPTERA: NEPIDAE), Esaki 177
ON THE PLACEMENT OF THE NAMES CADUCA AND RETIS (LEPID., PHALAENIDAE), Barnes and Benjamin 182
SOME INTERESTING CICADELLID PAPERS, Olsen 185
NEW LONG ISLAND RECORDS OF LEPIDOPTERA FROM A WHITE CEDAR SWAMP, Engelhardt 187
A NEW MAYFLY FROM PERU, Cockerell 189
KENTUCKY HETEROPTERA NEW TO THE STATE, Bueno 190
A NEW SPECIES OF SPHECODES FROM THE BELGIAN CONGO (HYMENOPTERA), Meyer 191
TILLYARD ON PERMIAN COLEOPTERA, Hatch 193
SOME NEW RECORDS OF AQUATIC HEMIPTERA FROM NORTHERN MICHIGAN WITH THE DESCRIPTION OF SEVEN NEW CORIXIDAE, Hungerford 194
COLLECTING NOTES FOR LONG ISLAND, NEW YORK, Bell 202
NOTES ON ABERRATIONS OF NEW JERSEY BUTTERFLIES, Rummel 203
BOOK NOTE, J. R. T.-B. 204
DIAMESA (PSILODIAMESA) LURIDA GARRETT (CHIRONOMIDAE, DIPTERA), Johannsen 205
PROCEEDINGS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY, Schaeffer and Bell 206

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXI December, 1926 No. 5

DESCRIPTIONS OF NORTH AMERICAN SPECIES OF PRISTAULACUS KIEFFER (HYMENOPTERA-AULACIDAE).

By J. Chester Bradley, Ithaca, N. Y.

Pristaulacus (Oleisoprister) taughanic n. sp.

♀. Black, shining; clypeus reddish yellow; mandibles slightly red medially; palpi black; front and middle legs beyond the trochanters reddish yellow; the middle femora infuscated at base; extreme tips of hind femora and the tibiae and tarsi reddish-yellow; the tarsi of all the legs more yellow in shade than the tibiae, the last joint infuscated, particularly strongly on the hind pair; petiole black, but the expanded part of the first segment red except its apical margin. Body except the abdomen covered with fine pale pubescence. Length 12.5 mm.

Basal area of mandibles depressed and punctured; clypeus with slightly prominent lateral angles and a median tooth, together with the face, closely and minutely punctulate; front above the antennae with sparse fine punctures and no indication of a median groove; ocelli in a low triangle, the hind pair about equidistant from each other and from the compound eyes; vertex polished and only indistinctly minutely punctulate; occiput margined posteriorly. Scape swollen below, second segment 2/3 its length, the two together slightly shorter than the third, which is about equal to the sixth, shorter than the fifth and much shorter than the fourth or longest segment; fourteen segments in all, the apical segments flattened, the last two short.

Pronotum rounded laterally, its angles not dentate, its lateral surface with a vertical median row of elongate pits; median lobe of mesonotum but little prominent, rounded in front, its anterior surface slightly roughened, its dorsal surface with 4 or 5 transverse sharp carinae which are divided in the middle by a shallow median groove, behind which are an equal number of stronger transverse carinae that are not interrupted medially; the inner half of each lateral lobe with 7 weaker transverse carinae, the outer half of these lobes obsoletely longitudinally aciculate; scutellum rugose; a few curved wrinkles surrounding the petiole dorsally and extending toward the posterior coxae, forming on the side of the propodeum, coarse and elongate reticulations; mesopleura punctured and shining, reticulate below and along the posterior margin.

Wings hyaline, somewhat iridescent but without a violaceous reflection; a square blue-black spot beneath the stigma and another large similar area at the apex of the wing. Cell R4 + 5 (2d and 3rd submarginals) separated from the cell M4 (first discoidal) by less than the length of the medio-cubital cross vein (caudal sector of the basal vein).

Hind coxae swollen underneath, forming toward their apices a blunt tubercle; posterior metatarsus longer than the following segments united; claws with three teeth beneath.

Abdomen polished and shining, strongly clavate, a little less than the basal half of the 1st segment forming a petiole. Ovipositor about 13 mm. in length.

Described from one female specimen caught by Mr. Henry E. Guerlac along a hedgerow in the new Taughannock State Park, August 3rd, 1925. Type.—Cornell University, No. 725.1.

This species is most closely allied to *P. stigmaterus* Cresson and *P. flavipes* Kieffer. From the former it differs in the absence of a median longitudinal groove on the front, in having black instead of yellow mouthparts, in having the hind tibia yellowish-red instead of brownish, in having less red on the abdomen, in having much larger, darker and more bluish spots on the forewing, and a shorter petiole, as well as in its larger size.

Pristaulacus (Oleisoprister) glabrescens n. sp.

Very close to *P. taughanic* from which, as described above, it differs in the following details:

Front and middle femora somewhat infuscated at base; *front with a shallow weakly indicated median groove;* carinae of medial mesonotal lobe a trifle less sharp; the inner half of each lateral mesonotal lobe with only 3 or 4 distinctly countable carinae; scutellum with fewer carinae forming rather distinct areolas; propodeum with weak carinae on its lateral surface, posteriorly devoid of carinae, smooth, polished and shining.

Described from one female from Albany, N. Y., June 5, 1909. Holotype: Cornell University, No. 748.1.

The smooth posterior surface of the propodeum, and the shallow median groove on the forehead are the characters which lead me to describe this as a species distinct from *P. taughanic*. It is evident that we have to deal with a group of allied species, the individuals of which are all of rare occurrence, and it will need a considerable accumulation of individuals to allow us to determine the extent of individual variation and the proper limits of species amongst them.

Pristaulacus (*Oleisoprister*) *flavipes* Kieffer.

> ♀. Black; following parts honey yellow: clypeus, the scape beneath, mandibles except at tip, palpi, front and middle legs except coxae, hind legs except coxae, first segment of trochanter and the femora; the scape above, anterior coxae, basal segment of posterior trochanter and posterior femora are brown; the last segment of each tarsus is weakly infuscated; the sides of the petiole in the extended part of the 1st segment except dorsally at apex and most of the 2nd segment, except dorsally, are reddish yellow. The female of this species differs from the foregoing description of *P. taughanic* in the points of color above noted, and in the following particulars:
>
> There is a simple but distinct tooth at the lower lateral angle of the pronotum; the median lobe of the mesonotum is less prominent and more rounded, so that the dorsal surface is less differentiated from the cephalic and the transverse ridges are continued on to the latter; these ridges are less sharply elevated; the outer half of the lateral lobe is not aciculate; there is a single transverse carina at some distance before the petiole and the propodeum below the petiole and laterally is uniformly, coarsely, reticulate, the meshes not elongate; the wings have a brown spot beneath the stigma, a faint cloud at tip and a minute spot along the vein M4 + CU1 (transverse median), the cells M4 (1st discoidal) and R4 + 5 (2nd and 3rd submarginal) touch one another; the under surface of the posterior coxa forms a straight line terminating in a weakly angled tubercle anterior to the apex; the petiole slopes inappreciably into the enlarged part of the first segment. As in other species of the subgenus, the claws have 3 teeth beneath.

Described from one specimen sent to me by Professor Herbert Osborn from Medina, Ohio, collected November 6th, 1889.

I have made the determination of this species by comparison with Kieffer's description of the male.

Allotype.—Cornell University, No. 726.1.

A NEW SPECIES OF SAPROMYZIDAE FROM CHINA (DIPTERA).

By J. R. Malloch, Washington, D. C.

The new species described below was lent to me by Dr. Aldrich, from the collection of the United States National Museum, for use in compiling a synopsis of the species of *Homoneura* van der Wulp occurring in the Oriental Region, which will be published elsewhere.

Homoneura chinensis sp. n.

Male and female.—Shining testaceous yellow, ocellar spot faintly darkened; antennae and palpi yellow; wings hyaline, inner cross vein not clouded, a dark mark on each extremity of outer cross vein which are narrowly connected in middle, a small dark spot on third vein proximad of level of outer cross vein, and similar spots on apices of veins 2 to 4 inclusive, the one on second vein darkest.

Frons subquadrate, all bristles strong, the anterior orbitals farther from eye than posterior pair; arista plumose. Thorax with three pairs of strong postsutural dorsocentral bristles, the anterior pair close to suture, one pair of strong prescutellar acrostichals, 8–10 series of intradorsocentral hairs, and two sternopleurals. Hypopygium similar to that of *grandis* (Kertesz), differing in details. Inner cross vein about three-sevenths from base of discal cell; penultimate section of fourth vein subequal to ultimate. Fore femur with an anteroventral comb; all tibiae with distinct preapical dorsal bristle; mid tibia with three strong apical ventral bristles.

Length, 6–7 mm.

Type, male, and allotype, Mt. Omei, 4,000 feet, Shin Kai Si, Szechuen, China (D. C. Graham).

Most closely related to *grandis* (Kertesz), which is known only from Formosa.

REMARKS ON THE LINNEAN SPECIES OF NEPA AND LACCOTREPHES (HEMIPTERA: NEPIDAE).

By Teiso Esaki, Entomological Laboratory, Department of Agriculture, Kyushu Imperial University, Fukuoka, Japan.

In his "Systema Naturae," ed. 10, 1758, Linné described seven species of the genus *Nepa,* of which four belong to *Nepa* or *Laccotrephes* of the present taxonomy. These are:

1. *Nepa rubra* Linné.
2. *Nepa fusca* Linné.
3. *Nepa atra* Linné.
4. *Nepa cinerea* Linné.

The types of these species, excepting *Nepa atra,* are now preserved still in good condition in the Linnean collection in the Zoological Institute of the University in Uppsala, and they were carefully examined by me when I visited the institute. To my great surprise, at that time I have found a noteworthy fact, that *Nepa rubra* Linné is not a *Laccotrephes*-species, as it has hitherto been treated by all the Hemipterologists, but is identical with the common palaearctic species, *Nepa cinerea* Linné.

The first three species of them have hitherto been treated as *Lacotrephes*-species, and, in fact, *"Laccotrephes ruber"* has been taken as the common Oriental species, whose abdomen is red on the dorsal surface.

Linné described *Nepa rubra* as follows (Systema Naturae, ed. 10, p. 440, 1758):

"N. fusca, abdomine supra alarumque nervis rubris. M. L. U.

"Habitat in Calidus *regionibus."*

And afterwards (Museum Ludovicae Ulricae, p. 165, 1764):

"Habitat . . .

"Corpus facie nostratis Nepae cinereae. Thorax sordidus, parum rugosus, antice et postice emarginatus. Elytra fusco-sordida. Alae albae vasis majoribus sanguineis. Abdomen a tergo sanguineum. Cauda in quibusdam seta duplici."

From these descriptions, it is quite sure that the venation of the hind wings is mostly blood-red in this species. This character occurs in *Nepa cinerea* Linné, but *not* in the so-called *"Laccotrephes ruber."* The type of this species is a female (length of body 22 mm., the same of caudal appendages 12.5 mm.), and labelled by Linné[1] as "rubra, Mus. Gust. Adolphi," which can never be a *Laccotrephes* as is seen from the photograph.

The so-called *"Laccotrephes ruber"* is about 30–35 mm. in length, and also does not agree with the character given by Linné, that "corpus facie nostratis Nepae cinereae," because, if *Nepa rubra* were about as large as " *Laccotrephes ruber,*" Linné might have surely given a remark on this character in his second, more detailed description (Mus. Ludv. Ulr.), as he did in the case of *Nepa fusca* in the same work, *i.e.,* he described the character of the latter, which is of the same size with *"Laccotrephes ruber,"* as "corpus ut in congeneribus, sed nostratae duplo majus."

Concerning the habitat of *Nepa rubra,* Linné described at first, "Habitat in Calidus regionibus," but in his second, more detailed one no statement was given. The type is not at all distinguishable from the common *Nepa cinerea,* which is known to be widely distributed throughout the palaearctic region, and southwardly so far as North Africa, and it is not at all unjust to consider, that the distributive extent of this species may be partly included in his "Calidus regionibus."

The types of *Nepa cinerea* are a single male (length of body 21.5 mm., the same of caudal appendages 8 mm.) and a single female (length of body 23 mm., the same of caudal appendages 11.5 mm.) and separated from the other types of the genus as the "species *non* in Linnei Mus. L. Ulr. descripta." The presumable cause why Linné described the specimens of a single species as different ones is that, in the unique type of *Nepa rubra,* the elytra and wings are expanded and the conspicuous coloration of the dorsal surface of abdomen, and of the venation of the hind wings are well observable, while in the types of *Nepa cinerea,* they are not expanded and the characters in question would have not been examined by Linné.

As *Nepa rubra* Linné precedes *Nepa cinerea* Linné in Systema Naturae, ed. 10, p. 440, the common palaearctic species should be named as *rubra* instead of *cinerea,* although the name was used by him also in his "Fauna Suecica," p. 245, 1761, and afterwards has come in general use; and also it is indeed very regrettable that such a name, almost popularized, should be changed.

Thus *Nepa rubra* Linné, 1758 et 1764, is identical with *Nepa cinerea* Linné, 1758 et 1761, but afterwards Fabricius has, for the first time, treated a *Laccotrephes* from Tranquebar, South India, under the name *"rubra"* (Entom. Syst., vol. 4, p. 62, 1794, and Syst. Rhyng., p. 107, 1803), which had earlier been described and figured by Stoll as "de zwarte Tranquebarsche Waterscorpioen" or "le scorpion aquatique noir de Tranquebar" (Natuurlyke en naar 't Leeven Naauwkeurig gekleurde Aubeeldingen en Beschryvingen der Cicaden en Wantzen, Amsterdam, Wantzen, p. 35, pl. 7, fig. "V," 1780), and afterwards followed by many authors. Ferrari, however, described this species as new under the name *"Nepa Kohlii"* (Ann. Naturhist. Hofmus., Bd. 3, pp. 173, 180, 1888), which should be adopted as the name of this oriental species.

The types of *Nepa fusca* Linné are two females (length of body 31 and 33 mm., the same of caudal appendages 22.5 + x and 21 + x mm. respectively (in both the specimens the apices of the caudal appendages are broken). As I have noted already, Linné described in his second description (Mus. Lud. Ulr., p. 166, 1764), that "corpus ut congeneribus, sed nostratae duplo majus." Fabricius thrice described *"fusca,"* i.e.,

1. (Syst. Ent., p. 692, 1775):

> "3 N. ecaudata, scutello rugoso, alis niveis. *Linn. Syst. Nat.* II. 713. 3. *Mus. Lud. Ulr.* 166.
>
> "Habitat in America.
>
> "Duplo major N. cinerea: tota fusca, solis alis albis."

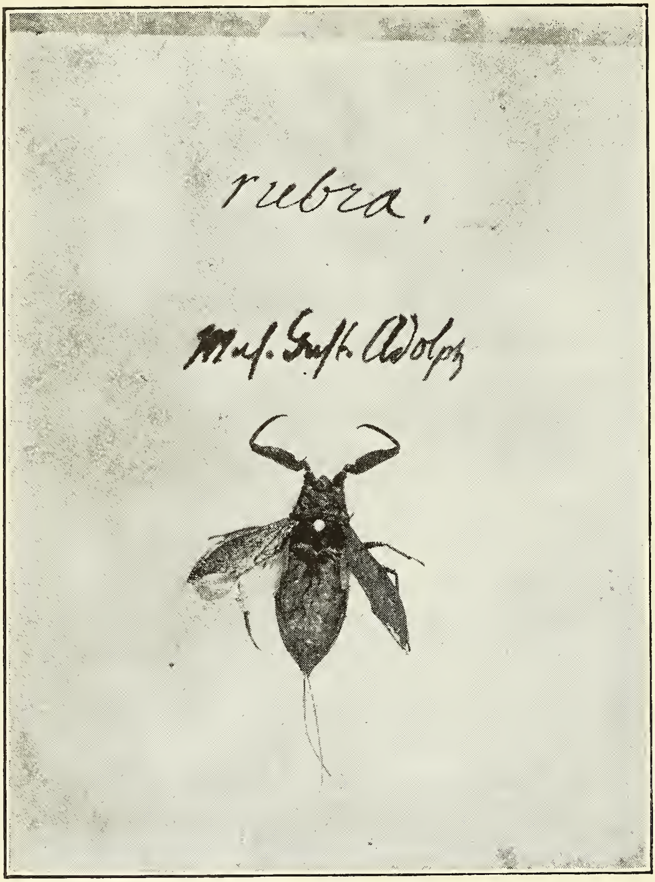
2. (Ent. Syst., vol. 4, p. 62, 1794):

> "4. N. cauda biseta, scutello rugoso, alis niveis. Linn. Hist. Nat. 2. 713. 3. Mus. Lud. Ulr. 166. Stoll. Cimic. 2. tab. I. fig. I.
>
> "Habitat in Indiae orientalis aquis.
>
> "Duplo major N. cinerea, tota fusca alis folis albis. Cauda longitudine corporis." and then,

3. (Syst. Rhyng., p. 107, 1803):

> "4. N. cauda biseta, scutello rugoso, alis niveis. Ent. Syst. 4. 62. 4.*
>
> *"Nepa fusca.* Linn. Syst. Nat. 2. 713. 3. Mus. Lud. Ulr. 166.
>
> "Habitat in India orientalis aquis.
>
> "Minor N. cinerea."

According to these descriptions, it is quite sure that all the three must be different species from one another. As the insect is "ecaudata," the first may be a Belostomatid, and judging from its description and habitat, it may be possible that the species is *Benacus griseus* (Say). The second and third are, however,



EXPLANATION OF FIGURE.[1]

The type of *Nepa rubra* Linné and its label (photo by G. Gustafson). $\times\frac{5}{4}$

with no doubt, *Laccotrephes*-species, but the former is "duplo major N. cinerea," while the latter is, on the contrary, "minor N. cinerea." It is almost sure that the second one is identical with the Linnean species according to the descriptions, notwithstanding Fabricius referred the species to the Stoll's figure (op. cit., pl. 1, fig. "I"), which shows a Belostomatid. The third may probably be *Laccotrephes grisea* (Guér) or another allied species, as it is smaller than "'*Nepa cinerea*."

---

[1] Dr. G. Gustafson, of the Zoological Institute of the University in Uppsala, wrote to me that the label of the type seems not to be written by Linné himself, but a later transcription.

The foregoing discussions on three Linnean species of *Nepa* and *Laccotrephes* are summarized as follows:

1. *Nepa rubra* Linné, 1758 et 1764.
   =*Nepa cinerea* Linné, 1758 et 1761.
   (The common palaearctic species.)
2. *Laccotrephes fuscus* (Linné), 1758 et 1764, *Nepa*.
   =*Nepa fusca* Fabricius, 1794.
   ± *Nepa fusca* Fabricius, 1775.
   ± *Nepa fusca* Fabricius, 1803.
   (Oriental.)
3. *Nepa cinerea* Linné, 1758 et 1761.
   =A synonym of *Nepa rubra* Linné, 1758 et 1764.

The oriental species hitherto named as "*Laccotrephes ruber*" by many authors is:

Laccotrephes Kohlii (Ferrari), 1888, *Nepa*.
=*Nepa rubra* Fabricius, 1794 et 1803.
=*Laccotrephes ruber* Mayr, Stål, Montandon, Distant, etc.
± *Nepa rubra* Linné, 1758 et 1764.

Before closing, I acknowledge my great indebtedness to Dr. Sixten Bock and to Dr. Gunnar Gustafson, of the Zoological Institute of the University in Uppsala, for their courtesy in preparing and forwarding the photograph of the type of *Nepa rubra,* which is shown in the present paper.

John Barton Angleman, for many years an active member of the Newark Entomological Society, died at the Perth Amboy Hospital, September 4, 1926, at the age of 76. He was an ardent collector of Macro-Lepidoptera, doing most of his field work in the vicinity of Newark, N. J. He furnished numerous records for the New Jersey State List of Insects.—G. P. E.

ON THE PLACEMENT OF THE NAMES CADUCA AND RETIS (LEPID., PHALAENIDAE).

By Wm. Barnes and F. H. Benjamin, Decatur, Illinois.

caduca Grt.

1876, Grote, Can. Ent. VIII, 207, *Eustrotia.*
1893, Smith, Bull. U. S. N. M., XLIV, 311, *Erastria.*
1895, Grote, Abh. Nat. Ver. Bremen, XIV, 118, *Eustrotia.*
1903, Dyar, List, 209, No. 2608, *Eustrotia.*
1910, Smith, Ins. N. J. (1909), 472, *Erastria.*
1910, Hampson, Cat. Lep. Phal. B. M., IX, 22, text f. 4, *Gortyna.*
1913, Forbes, Jour. N. Y. Ent. Soc., XXI, 182, *Helotropha.*
1917, Barnes & McDunnough, Check List, 69, No. 2634, *Helotropha.*

form retis Grt.

1879, Grote, Can. Ent., XI, 198, *Eustrotia.*
1893, Smith, Bull. U. S. N. M., XLIV, 311, *Erastria.*
1895, Grote, Abh. Nat. Ver. Bremen, XIV, 118, *Eustrotia.*
1903, Dyar, List 209, No. 2608, *Eustrotia.*
1910, Hampson, Cat. Lep. Phal. B. M., IX, 23, pl. CXXXVII, 18, *Gortyna.*
1911, Forbes, Jour. N. Y. Ent. Soc., XXI, 182 (footnote), *Helotropha.*
1917, Barnes & McDunnough, Check List, 69, No. 2635, *Helotropha.*

Both names have, heretofore, been retained as species. Our series, including fresh specimens received from Mr. C. Rummel, shows a single variable species. We base our determinations on specimens compared with the types of both names, in the British Museum, by Dr. J. McDunnough. The form *retis* was collected along with *caduca* at Green Village, N. J., by Mr. Rummel, and the name should be added to the New Jersey Faunal Lists. We have both from New York, and a single specimen of *caduca* from Illinois. The latter was described from Michigan; and *retis* from Pennsylvania. The species appears, therefore, rather generally distributed, but is not common in collections. Grote, 1876, gives the food plant as "Yellow Pond Lily (*Nuphar advena*)" and Smith, 1910, as "*Sagittaria.*"

Hampson places the names in the genus he calls *Gortyna* in his subfamily "Acronyctinæ" recte Apatelinæ. *Gortyna* Ochs. has, as type, *flavago* D. & S., designated by Curtis, 1829; *Ochria* Hbn. and *Xanthoecia* Hamps. are synonyms with the same genotype. Probably the genus is strictly European as *buffaloensis* Grt., the sole species placed in "*Xanthoecia*," in North American lists, is presumably not strictly congeneric with *flavago*. *Helotropha* Led., type *Noctua fibrosa* Hbn., is available for *Gortyna* of Hampson as far as *reniformis* Grt. and its varieties are concerned.

But *caduca* and *retis* are not congeneric with *reniformis*. Vein 5 of the hind wing is strong enough to warrant placement in the subfamily Hampson calls "Erastriinae." Grote has, on several occasions, shown that Ochsenheimer simply stole the name *Erastria* from the Huebner Tentamen, and that *Erastria* is a Geometrid genus. Also on plate CCIII of the Samml. exot. Schmett. Huebner figures "**Erastria** *immista* **Dissimilaria**," a typical Geometrid, and this plate may well have been issued prior to *Erastria* Ochs. (1816); Huebner's prospectus of 1809 saying that 78 plates (not consecutive) had been issued, and his next prospectus (dated 1823) offering 371 plates. We make mention of this to give those who would reject the Tentamen a chance to carefully consider just what they would do with "*Erastria*." Personally we think the Tentamen names available, and consider *Erastria* Ochs. a homonym of *Erastria* Hbn. Tentamen. As for *Erastria* Ochs., we might also mention that no less than six different genotypes have been designated. The earliest fixation of a type appears to be 1826, Curtis, Brit. Ent., I, 140, *Phalaena uncana* L. This we accept as type of *Erastria* Ochs. nec Hbn., and place the name as a homonym under *Eustrotia* Hbn., type *Noctua unca* D. & S., designated by Grote, 1874, Bull. Buff. Soc. Nat. Sci., II, 37. Even were *Erastria* Ochs. available it could not be used for the European *trabealis*, etc., a use sponsored by Hampson and Warren because of their "first species" rule. These European species belong in *Erotyla* Hbn. (Tentamen), with synonymic genera *Emmelia* Hbn. and *Agrophila* Bdv.

This placement of *Erastria* Ochs. causes us to substitute the name Acontiinæ for Hampson's Erastriinæ, a change we do not regret as it simply substantiates Grote's work. The type genus is *Acontia* Ochs. The first type designation we find for *Acontia* is in 1829. Duponchel designated *solaris* and Curtis designated *luctuosa* in the same year. We cannot say which designation has priority, but tentatively consider the genotype as *solaris*. Hampson, 1918, Nov. Zool., XXV, 200, has already discarded his Acontiinæ of the Cat. Lep. Phal. B. M. for "Vestermannianæ." He derives this from *Westermannia* Hbn. If this genus is to be used as type for the subfamily called Acontiinæ in the Catalogue, Article 4 of the International Zoological Code would seem to compel the name to be Westermanniinæ.

At any rate the name Acontiinæ seems available for "Erastrinæ" as employed by Hampson.

Lithacodia Hbn. [type *bellicula* Hbn., sole species of both the Zutrage (1816?) and the Verz. (1822)], appears to be the genus containing species congeneric with *caduca* and *retis.* The peculiar abdominal tuftings of *caduca,* and even the habitus of the species, is duplicated in *Lithacodia apicosa* Haw. Frons, legs, and venation also agree.

Remarks on Megistias neamathla Skinner & Williams.—Lepidoptera-Rhopalocera.—The writer has made a series of genitalic mounts of this species and also of *Megistias fusca* Grote and Robinson, and all of the specimens of *neamathla,* from which the slides were made, have the subapical spots of the primaries, mentioned in the original description, whereas, none of the specimens of *fusca* show any trace of these spots, though some of them have two, ill-defined, discal spots; it would seem, therefore, that the presence of subapical spots would serve as a character to separate *neamathla* from *fusca,* at least in the majority of cases. *Neamathla* was described from specimens from Central Florida, and there are specimens in the collection of the writer from Tampa, Florida, and Mobile, Alabama, genitalically determined.—E. L. Bell, Flushing, N. Y.

A New Locality for Thanaos tristis Boisduval.—Lepidoptera-Rhopalocera.—Among a consignment of specimens of submarginal white spots on the under side of the secondaries *Hesperiidae* received from Mr. E. J. Oslar, which were collected by him in the Casper Mountains, Wyoming, during July, 1925, is a single male specimen of this species, genitalically determined, which is identical in superficial appearance with other specimens from California in the writer's collection. The absence of the submarginal white spots on the under side of the secondaries places the specimen with the typical form instead of with the form *tatius* Edwards, commonly taken in Arizona.—E. L. Bell, Flushing, N. Y.

SOME INTERESTING CICADELLID PAPERS.

By Chris. E. Olsen, West Nyack, N. Y.

In receiving a lot of miscellaneous papers on Homoptera, I chanced to run across a few pamphlets on *Cicadellidae* which were interesting in various ways. They had one peculiarity in common and that was they were all published several years previous to 1918, but not listed in the Catalogue by Van Duzee which appeared in print then. Some of these papers did not come within the scope of this splendid work which, of course, must have a limit of papers to catalogue, others were perhaps accidently overlooked. This may be expected when considering the tremendous task of compiling such a volume.

It may be advisable and of some use to briefly describe and comment on these few papers, since it appears that workers are apt to take for granted that all papers previous to 1918 are generally known, unless they stumble on these as I did. Although the papers are not important enough to have any effect on the taxonomic standing of the cicadellid nomenclature, yet they have some interesting features, which, perhaps, some workers would want to consult at some time or other. At least all cicadellidists should know that they exist. Reporting on these in a chronological order they are as follows:

Bruner, Lawrence.—Annual Report of Nebraska State Board of Agriculture, 1899. Report of the Entomologist.—A preliminary report of the insects affecting native grasses on our prairies and in meadows. A short discussion on the economics of the leafhoppers in general mentioning several important species. As a taxonomic paper this is worthless. It is beautifully illustrated on rather poor quality paper with sixteen plates borrowed from papers that are out of print and exceedingly hard to secure. Seven plates are borrowed from Studies of the Life Histories of Grass-feeding Jassoidea, by Osborn and Ball, Iowa Agri. College Exp. Sta. Bul. 34. 1897, and six from Studies of North American Jassoidea, Osborn and Ball, Dav. Acad. Nat. Sci., VII, 1897. These thirteen plates picture forty-five grass-feeding Cicadellidae and are interesting from this point of view. (The remaining three plates do not deal with Cicadellidae.) The various species illustrated are not listed nor is there any reference made to these anywhere in the paper.

Felt, E. P.—Insect Types in New York State Museum, N. Y. St. Mus. Bull. 141, July 15, 1910. Pp. 119–122.—In this paper are listed all the insect types in the New York State Museum at Albany, to its date (1910). Sixty-three of the species mentioned, or more than one-third of the entire list, are Homoptera. Not a single Heteropteron is listed. The family Cicadellidae is represented out of this number by thirty species. Out of the sixty-three species, five were described by Osborn, the remaining fifty-eight were described by Fitch. Most of the Fitch types are of extremely common species. This paper may not be of interest enough to be compiled with a list of species in a catalogue, but as a whole it is very serviceable in that it gives you at a glance the complete list of the insect types that were to be found in this institution at that time. (Although no author is assigned, Dr. E. P. Felt was then State Entomologist, and must, therefore, assume responsibility for this paper.)

Young, D. B.—Additional List of Adirondack Insects, Report of the State Entomologist, 1909, N. Y. St. Mus. Bul. 141, July 15, 1910. Pp. 123–125.—A short paper by Mr. Young on insects collected by him on a vacation trip at Speculator, N. Y., which place is located about Lake Pleasant. He mentions of being particularly impressed with the large representation of Hemiptera in the collected material. About half of all the species captured were Hemiptera. Identifications were made by Van Duzee. Thirty-one species out of sixty-seven were new reports for Adirondack Hemiptera. Twenty-seven species were Cicadellids. The list is annotated by a number of interesting footnotes. It is of interest and importance to those studying distribution of insects. He mentions several names that are not common.

Crumb, S. E.—"The Jassoidea of Kansas," Trans. Kans. Acad. of Sci., XXIV, 1911. Pp. 232–238.—A list of forty-five genera, one hundred sixty-eight species very neatly gotten up, for the most part giving definite localities, dates and in many instances mentioning some plants in connection with the capture. It gives full credit to collectors where the collectors are known. Nearly all the material was identified by Dr. E. D. Ball. The list includes material collected by F. F. Crèvecoeur, Warren Knaus, S. E. Crumb (author) and in Kansas University collection.

In checking up the list of species, it was found that sixteen specific names in this little paper were not accounted for in the recent Kansas list of cicadellids. Besides this, a considerable number of notes on distribution, plant association and habits of the insects with which Crumb's paper was liberally annotated, were left out. Crumb's little list may well be considered quite a good *Preliminary list of Cicadellidae of Kansas.* It is unfortunate that it was not given this credit.

Crumb, S. E.—" A Partial Key to the Genera of North American Jassoidea," Trans. Kans. Acad. Sci., XXV, 1912.—Key to the families and Genera of Jassoidae or Cicadellidae of North America excluding Mexico. Bases his study on the work of Ashmead, 1889; Van Duzee, 1889–1892; Edwards (British), Woodworth, 1889; Baker, 1892; Gillette, 1898; Ball, 1901; Osborn, 1905. Does not treat Athysaninae, Acocephalidae and Typhlocybidae. This paper may not be very useful to-day but a reference to its existence should be found somewhere.

NEW LONG ISLAND LEPIDOPTERA RECORDS FROM A WHITE CEDAR SWAMP.

At present only two stations for White Cedar, *Chamaecyparis thyoides,* are known to the writer on Long Island—one at Merrick on the south shore and another fifty miles east at Riverhead, facing Peconic Bay on the north shore.

The Merrick station, formerly very extensive and containing many trees in excess of one foot in diameter, has now been destroyed, excepting a small portion at the head of the swamp which is privately owned. No intensive collecting has been done in this region.

The Riverhead station has long been known to entomologists including Wm. T. Davis, Henry Bird, H. C. Huckett and others, but it is difficult of access and serious collecting has been postponed from year to year. In its original extent this swamp comprised a hundred or more acres of which less than the lower half has been dammed off and converted into a cranberry bog, while the upper part, through the raising of the water level, has been transformed into a shallow lagoon, luxuriant in its growth of water-lilies, pickerel weed, sedges and other aquatic vegetation.

Innumerable submerged cedar stumps indicate that this tree at one time covered all of the inundated parts of the region. The cedars living to-day are rather small, not exceeding six inches in diameter and restricted to small islands and peninsulas near the margin of the lagoon. The swamp is fed by a stream of clear water flowing out of Great Pond half a mile above.

On August 9, in company with Mr. Deck, of the Brooklyn Children's Museum, and Mr. Huckett, of the Experiment Station, Calverton, L. I., collecting proved interesting on the blossoms of button bush and milkweed along the dam of the cranberry bog. The capture of a fine female specimen of *Euphyes dion* Edw. appears to be the first Long Island record for the species. Another skipper, *Poanes massasoit* Scud., now scarce elsewhere on the island, was quite common. In a slough of white cedars among sphagnum and sundews there were quite a number of the pitcher plant—*Sarracenia purpurea*—almost every one showing evidence of the larvae of *Papaipema appasionata* by the pellets thrown up at the base of leaves and of *Exyra rolandiana* by the frass-packed leaf cups. From one plant, removed entire, packed in a tin pail and transported to the Brooklyn Museum laboratory, two males of *P. appasionata* emerged, one on September 16 and the other October 6. Two specimens of *E. rolandiana* were found dead on the bottom of the breeding cage upon the return from a vacation on September 10. Both looked fresh and their emergence could hardly have taken place before September 1.

For New Jersey the species is listed as single brooded (May–June). Our record indicates two broods for Long Island. During September several small larvae were observed on the inner side of leaves. Of course the range of these species is to be expected to correspond with the distribution of their food plant; nevertheless it is a satisfaction to verify such an assumption and especially on Long Island where so many of the breeding places are being rapidly destroyed.

Another beautiful species of the *Papaipema* group which we hope to find in the white cedar swamp at Riverhead is *P. inguaesita.* Its food-plant, the sensitive fern—*Woodwardia virginica*—grows there in abundance. Mr. C. R. Inglee, the owner of the cranberry bog, has shown a sympathetic interest in our investigations. With the privilege of using his rowboat on the lagoon, we hope to furnish a fuller report next season.

A NEW MAYFLY FROM PERU.

By T. D. A. Cockerell, Boulder, Colorado.

When I was recently at Arequipa, Perú, Dr. Edmundo Escomel handed me a number of specimens of a remarkable mayfly which he had obtained in that locality. The specimens are not in very good condition, but they represent a very distinct species of the remarkable genus *Spaniophlebia* of Eaton. Eaton described two species, *S. trailiae* from S. Paulo, Brazil, and *S. pallipes* from Ecuador.

Spaniophlebia escomeli n. sp.

> ♀. Length (excluding setae) about 13 mm.; length of anterior wing about 19 mm.; eyes large, oval, far apart; thorax robust, entirely pale ferruginous; abdomen dusky but not very dark brown; wings greyish hyaline, with an almost bluish tint; setae light brownish, naked. Venation differing from that of *S. trailiae* Eaton, the type of the genus, as follows: seven cross-veins between radius and media; four cross-veins between m_1 and m_2; two thin and pale cross-veins between m_2 and m_3, the first a considerable distance before first cross-vein above, the second between second and third cross-veins above; m_4 arising from m_3 at a much greater distance from base of wing, and the resulting fork broader, thus the m_3–m_4 fork is considerably more remote from base than the cubital fork. The hind wings reach almost to apex of abdomen. The wings are without dark markings. From *S. pallipes* it is easily known by the light ferruginous thorax, naked setae, and other characters.

Eaton's "Palingenia section" includes three neotropical genera, one both Palaearctic and Neotropical, one Oriental and Palaearctic (with a doubtful Brazilian species), and one from Natal. The species are not numerous; Eaton listed 17 in the whole section. The distribution suggests that we have a waning type, which may be expected to turn up as a fossil in regions where it no longer occurs living.

Looking up possible names for the Arequipa species, I came across *Nusalala escomeli* Navás, 1922, from Perú, given in the Zoological Record as a mayfly. But *Nusalala,* as I learn from Dr. N. Banks, was wrongly placed in the Record, and is actually a Hemerobiid, hardly more than a section of *Micromus.*

The greater part of the Pacific coast region of South America, except the northern and southern ends, is excessively dry, and ill-suited to mayflies. Since Eaton's monograph, many species have been described from Argentina, but few from west of the Andes. In 1920 Navás described from Chile a species of the genus *Deleatidium;* which was originally based by Eaton (1899) on a species from New Zealand. Navás has described *Nousia,* a new Leptophlebine genus, and species of *Callibaetis* and *Pseudocloëon* from Chile.

KENTUCKY HETEROPTERA NEW TO THE STATE.

By J. R. de la Torre-Bueno, White Plains, N. Y.

During his stay in Kentucky in the summer of 1924, Mr. Geo. P. Engelhardt took a few Heteroptera, all of which turned out to be heretofore unreported from Kentucky, according to Van Duzee's Catalogue, which I have used as a point of departure. They are also in the order given by this author, to facilitate comparison and checking.

Corimelaena lateralis Fabricius—Pineville, July 20. This species is known from Massachusetts to Texas, but not from Kentucky.

Pangaeus bilineatus Say—Pineville, July 20. Another species ranging from Quebec to Texas and into Mexico, but reported neither from Kentucky nor from the bordering states.

Stiretrus anchorago Fabricius—Pineville, July 20. Ranges from Massachusetts to Texas.

Megalotomus quinquespinosus Say—Clear Creek Springs, July 20. This species is known from Quebec to Florida and from Massachusetts to California.

Alydus eurinus Say—Clear Creek Springs, July 20. Has the same range as the preceding to Texas.

Stenopoda culiciformis Fabricius—Great Onyx Cave, July 10. This reduviid is known from New York south to Florida, Oklahoma and Texas.

Reduvius personatus Linné—Great Onyx Cave, July 10. This cosmopolitan species has been recorded from Quebec and Ontario to Florida and west to Kansas.

Rocconota annulicornis Stål. Clear Creek Spring, July 20. This species, originally described from Mexico, was then recorded from Texas and later from New Jersey (two specimens caught by myself). This is the fourth record of the species known to me.

Sinea spinipes H. S. Pineville, July 20. This species has been recorded only from New York, Georgia, Florida, Kansas and Colorado. This is a very interesting record of a subtropical species.

Neurocolpus nubilus Say. Clear Creek Springs, July 20. The range of this common species is from Quebec and Ontario to Florida and Texas, although not recorded from Kentucky.

Gelastocoris oculatus Fabricius—Pineville, July 20. Ranges from New York to Florida and west to Minnesota and Arizona. Some of these records are suspect, but this specimen is the species positively.

Arctocorisa nitida Fieber—Pineville, July 20. A species recorded only from Maine, Maryland, North Carolina and Georgia. This makes the fifth state and most western record.

Only two species of Heteroptera are recorded by Van Duzee from Kentucky out of the more than 1,500 listed in his catalogue. These are the common and widespread *Notonecta undulata* Say and the notorious *Benacus griseus* Say. Two others are recorded by inference: The universal *Cimex lectularius* Linné given from all states, and the widespread *Lygus pratensis* Linné to be found in "all U. S."

A specimen from Cumberland Gap, Tennessee, of the pentatomid *Euschistus politus* Uhler, is the first record of the species from that state.

A NEW SPECIES OF SPHECODES FROM THE BELGIAN CONGO. (HYMENOPTERA.)

By Dr. R. Meyer, Darmstadt, Germany.

Sphecodes bequaerti n. sp.

Female. Length, 11 mm.

Head and thorax black. Abdomen red on segments 1 to 3, black on segments 4 to 6.

Head as wide as the thorax, densely punctate, the diameter of the dots larger than the spaces between them. Face and cheeks, as well as the vertex, densely white pilose. Antennae black. Thorax also densely punctate, the punctures twice as large as those of the head, but also very close together. Scutellum distinctly bigibbose; the punctures spaced on the raised portions, so that the gibbosities are shiny; between the raised parts the punctures are fine and dense. Cordiform area coarsely and irregularly rugose. Pleura densely and uniformly punctate, covered with dense, white pilosity. First segment of abdomen smooth and shiny, with fine and long, white hairs on the sides. Second segment with a basal depression, with very fine, deep punctures and downy pilosity; the puncturation and pilosity more extended on the sides. Third, fourth and fifth segments with dense and fine punctures and hairs, except for a broad, smooth, apical margin; the pilosity longer and erect on the sides. On the sixth segment the hairs are yellowish brown, dense and erect. Legs black, densely covered with white hairs, the tibial spurs pitch-brown; the terminal segments of the tarsi more reddish. Wings slightly smoky, the radial cell and the outer margin more infuscate. Eight hooklets (hamuli) on the hind wing.

Holotype from Boswenda, north of Lake Kivu, Belgian Congo (1° 20′ S., 29° 20′ E.; altitude: 1,900 m.), October 22, 1914. Collected by J. Bequaert.

Type at the Congo Museum, Tervueren.

Additional Records of the Distribution of some North American Hesperiidae.—Lepidoptera–Rhopalocera.—The following species of *Hesperiidae* in the collection of the writer were taken by Mr. O. C. Poling in the vicinity of Alpine, Texas, during 1926, and although they have been recorded from the other near-by states, and some of them from Mexico, there does not appear to be any specific record of their occurrence in Texas. Alpine is located in the "Big Bend" region of Texas, in the western part of the state and not a great ways from the Mexican border. *Cogia hippalus* Edwards, June; *Thorybes drusius* Edwards, April; *Oarisma edwardsi* Barnes, June; *Chaerephon simius* Edwards, March, May, July; *Augiades morrisoni* Edwards, March; *Atrytonopsis pittacus* Edwards, March, April; *Amblyscirtes nereus* Edwards, April, June, July; *Amblyscirtes phylace* Edwards, July.—E. L. Bell, Flushing, N. Y.

TILLYARD ON PERMIAN COLEOPTERA.

By Melville H. Hatch, Department of Animal Biology, University of Minnesota, Minneapolis, Minnesota.

Too late for incorporation in my summary of *Palaeocoleopterology* in the previous number of this Bulletin I saw a paper by Tillyard on *Upper Permian Coleoptera and a New Order from the Belmont Beds, New South Wales* (Proc. Linn. Soc. N. S. W., 1924, 49: 429–435, 3 figs.). In this paper are described six species of Coleoptera from elytra. So far as they exhibit affinities at all, they seem to be related to the Hydrophilidae, though I doubt whether the evidence is sufficient for the erection of the two new families, Permophilidae and Permosynidae, that Tillyard describes for them. The significance of elytral characters must be understood much better than at present before very many at all of the pre-Cenozoic and not a few of the Cenozoic beetles can be assigned to families.

The most noteworthy portion of the article is the description of a new order from the same deposits, Protocoleoptera, described from an elytron that exhibits a complete system of venation in rather close agreement with that of the Protoblattoidea. There is no reason for not following Tillyard in the view that he has discovered an insect that was a member of a group more or less intermediate between Protoblattoidea and Coleoptera.

Tillyard's paper, therefore, exhibits for the first time definite palaeontological evidence concerning the origin of the Coleoptera, which is, moreover, in complete accord with the previous finding of comparative morphology by Handlirsch. Furthermore, the lower distribution of the Coleoptera is extended from the Middle Trias to the Upper Permian. As has been pointed out previously, there is reason to suspect that the varied conditions of the Lower Permian had something to do with the rise of Coleoptera, so that this discovery brings us closer to the period of the presumable origin of the beetles—a period when, it may be guessed, beetles were very rare organisms. Only six species of Upper Permian insects are listed by Handlirsch from the northern hemisphere, so that it is not impossible that the beetles had even then a cosmopolitan distribution. The converse, likewise, is possible, and the present discovery may be evidence that the Coleoptera, in common with the Glossopteris flora, arose in the southern hemisphere in the interglacial periods and thence spread somewhat later to the rest of the world.

SOME NEW RECORDS OF AQUATIC HEMIPTERA FROM NORTHERN MICHIGAN WITH THE DESCRIPTION OF SEVEN NEW CORIXIDAE.[1]

By H. B. Hungerford, Lawrence, Kansas.

For the past four summers the writer has been collecting and studying the aquatic hemiptera of the region about Douglas Lake, Michigan. Two new Mesovelia (1, 2)[2] and one Buenoa (3) have been taken and described from the immediate neighborhood of the Michigan Biological Station. Collecting trips have been made to Nigger Creek, just north of Topinabee, to the north shore of the southern peninsula and to Mackinac Island. Several interesting records to the list of the water bugs of the region may be added to those published by Roland F. Hussey (4) in 1919. One of these is *Nepa apiculata* Uhler, a single female specimen of which was taken by Dr. Paul S. Welch in Maple River, the outlet of Douglas Lake. Maple River leads from the west end of Douglas Lake to Burt Lake. The specimen was taken August 15, 1919.

Marked changes in the water bug population have taken place since the collections made by Miss Eva G. Miller (now Mrs. Paul S. Welch) in 1913 and by Mr. Hussey in 1918. Indeed great changes have been noted since my first experiences in the region in 1923. That year Smith's bog was a very rich collecting ground for *Notonecta borealis* Bueno & Hussey. I took two or three hundred specimens and could have collected many more. *Notonecta irrorata* Uhler was also common beneath the shady overhanging shelter of the alders. In the summer of 1925 this splendid collecting place was dry. This was Hussey's station XII. Sedge Point pool has continued to supply *Notonecta borealis* Bueno and Hussey as the dominant member of the genus with *Notonecta irrorata* Uhler a good second. This magnificent pool became practically dry by the end of the season 1925 but is flourishing again in 1926. The *Notonecta borealis* Bueno and Hussey is abundant but the other members of the genus are very scarce indeed. The *Buenoae* which were very abundant in this pool hitherto appear to be scarce in 1926. *Notonecta lunata* Hungerford (=*Notonecta variabilis* Fieb. *et al.*) (5) which was reported by Miss Miller and by Mr. Hussey as common in Bessey Creek is still to be taken there. This species and *Notonecta undulata* Say are exceedingly abundant by the Nigger Creek bridge north of Topinabee. Much confusion between pale examples of *N. undulata* Say and *Notonecta lunata* Hungerford has occurred. The two species are readily distinguished by the fact that the former has a rounded mesotrochanter and the latter an angulate mesotrochanter. I secured *Notonecta insulata* Kirby, as well as *N. borealis* B. & H. and *N. irrorata* Uhler, from a pool on the east shore of Mackinac Island but few specimens of Kirby's species from the vicinity of Douglas Lake and those from Sedge Point pool. *Ranatra fusca* P. B. is abundant in Sedge Point pool and several other places but no specimens of *Ranatra nigra* H. S. (=*R. protensa* Mont.) have been taken.

---

[1] Contributions from the Biological Station of the University of Michigan, Douglas Lake, Michigan.

[2] Numbers in parentheses refer to the bibliography.

There are numerous interesting records of Corixidae to be added to the Michigan state list but these are appearing elsewhere. The following new species were taken within the territory designated above.

Arctocorixa decoratella sp. n.

Size: Length 7.5–8 mm.; width across the eyes 2.2 mm.

Color: Very dark—the pale lines dark and on tegmina very slender. About nine, more or less faint, pale transverse lines on pronotum. The slender pale bands of clavus parallel and straight on basal half, somewhat wavy on distal half. Corial lines slender and slightly undulate and broken. Margin of outer angle of corium pale. Membrane dark brown with faint slender wavy pale lines.

Structural characteristics: Pronotum and tegmina rastrate, rear half of pronotum marked by several distinct transverse depressed lines, often accentuating the transverse bars. Metaxyphus of medium length, lateral lobes of prothorax slender. Pala long and narrow in both sexes, that of male as shown in Fig. 14. Strigil small, ovoid, six rows of teeth, the anterior rows short. Male genital capsule as shown in Fig. 3.

Described from 12 specimens taken on Mackinac Island by the writer August 19, 1925.

Holotype, allotype and paratypes in University of Kansas Museum.

Comparative Notes: General shape of pala similar to *A. decorata* Abbott. This is however a smaller species and has a metaxyphus that is of the usual form rather than like that of Abbott's species.

Arctocorixa douglasensis sp. n.

Size: Length 5.8 mm., width across eyes 1.6 mm.

Color: General color light. Head, limbs, body and lines of dorsum pale yellow. Pronotum crossed by six pale bands. Clavus and corium marked by longitudinal wavy pale bands which are broadest at base of clavus. Three of these undulate bands on clavus, outer two parallel with claval suture; four on the corium, the outer one bordering the embolium which is pale yellow. The dark pigment of pronotum and wings reddish brown.

Structural characteristics: Head rounded, inner margins of eyes parallel. Eyes more remote from the rear margin of the head than in many Corixids. Pronotum with longitudinal carina on anterior portion, surface shining. Tegmina smooth and shining. Pala in both sexes thin. Female pala of usual form, that of male as shown in Fig. 8. Metaxyphus long and slender (see Fig. 5). Male strigil long and slender, of six striæ. Right clasper of male genital capsule slender (see Fig. 1).

Described from 29 specimens, 11 males and 18 females, taken by the writer in the region of Douglas Lake, Michigan.

Holotype, allotype and some paratypes in University of Kansas collection. Others in the Museum of Zoology at Ann Arbor, Michigan.

Arctocorixa macropala sp. n.

Size: Length 5.3 mm., width across eyes 1.7 mm.

Color: General impression dark. The dark pigment rich brown, almost black. The pale lines and markings of thorax and tegmina reddish yellow. Head, limbs and thorax pale yellow, basal segments of abdomen sometimes dark in color. Six pale bands on pronotum, the nearly black bands prominent, pale markings of tegmina slender, irregular, short transverse lines and spots.

Structural characteristics: Head bluntly conical. Inner margin of eyes slightly divergent. Face of male depressed and dorsum of head with distinct median longitudinal carina. The rear margin of head flattened, rastrate and medially produced. Slight median longitudinal carina on anterior third of pronotum, the surface of which is rough. Tegmina roughened by coarse rastrations. Metaxyphus short, broadly triangular (see Fig. 6). Male strigil small, longer than broad, composed of about 4 striæ. Right clasper of male genital capsule thickened at base with terminal half turned at nearly a right angle (see Fig. 9). Male pala as shown in Figure 11.

Described from 12 specimens taken at Douglas Lake, Michigan.

Holotype, allotype, and paratypes in Kansas University collection.

Comparative notes: This is a very striking species readily distinguished by the characters above enumerated. The large pala of the male suggested the name chosen to designate this species.

Arctocorixa minorella sp. n.

Size: Length 6.4 mm., width across the eyes 2 mm.

Color: General color rather dark, pronotum crossed by 6 or 7 pale lines. Pale lines of clavus and corium short, transverse and irregular in shape; tip of corium pale, membrane brown with suffused pale mottlings. Embolium smoky black in darker specimens. Venter black in dark males.

Structural characteristics: Body plump, head and pronotum short. Pronotum, clavus and basal two-thirds of corium somewhat rastrate. Metaxyphus long, slender. Lateral lobes of prothorax broad, face short. Pala of male as shown in figure 10. The right clasper of male genital capsule enlarged at tip as shown in figure 12. Strigil long and slender, three striæ. Pala of female not distinctive.

Described from 20 specimens from Douglas Lake, Michigan.

Holotype, allotype, and paratypes in University of Kansas Museum collection.

Comparative notes: General appearance like *A. minor* which was named by Dr. Abbott as a variety of *A. nitida* (Fieb.).

Arctocorixa michiganensis sp. n.

Size: Length 6.8 mm., width across eyes 2.1 mm.

Color: The general color same as for most corixids. The brown pigment dominant over the yellow. About six yellow bands on pronotum, the pale markings of tegmina in the form of short, thin, transverse lines, the longer ones of which are irregularly undulate. Membrane smoky brown covered with irregular pale blotches except on margin. Limbs and thorax yellow, abdominal venter brownish, front margin of hind tibia reddish brown.

Structural characteristics: Head short but broad, inner margin of eyes divergent. Metaxyphus long. Male strigil long and slender with five somewhat irregular striæ. Pala of male as shown in drawing (see figure 15).

Described from a long series from Douglas Lake, Michigan region.

Holotype, allotype and some paratypes in Kansas University Museum. Others in Museum of Zoology, University of Michigan, Ann Arbor, Michigan.

Comparative notes: This corixid is of average size and is distinguished by the broad rounded cap-like head fitting closely over a short rounded pronotum, the shining surface of the dorsal aspect and by the structural characters mentioned above.

Arctocorixa solensis sp. n.

Size: Length 5.7 mm., width across head 1.7 mm.

Color: General color same as for most corixids. The pronotum crossed by six pale bands. The pale bands on base of clavus prominent and radiating obliquely from margin of pronotum, and basal part of hemelytral suture. The pale lines on distal half of clavus slender, irregular and more or less broken. Those of corium, slender transverse and irregular and broken. Pale line separates corium from membrane which is mottled in the usual fashion. Head, venter and limbs pale yellow. Basal segments of abdomen sometimes dark.

Structural characteristics: Head short, rounded; face long, inner margin of eyes divergent. Pronotum and tegmina somewhat rastrate. Metaxyphus long and slender. Strigil of male circular, of four striæ. Pala of male as shown in drawing (Fig. 13).

Described from 24 specimens from the Douglas Lake region.

Holotype, allotype and paratypes in the University of Kansas collection.

Comparative notes: This species is best recognized by the pale obliquely radiating lines on the base of the clavus.

Arctocorixa variabolis sp. n.

Size: Length 5.6 mm., width across eyes 1.6 mm.

Color: General color very dark, nearly black, the usual yellow bars almost obliterated; faintly visible on pronotum and base of clavus. These are replaced on distal half of clavus and on corium by irregular spots of variable arrangement, often entirely blotted out by a solid color of brownish black. A pale line separates the corium from the membrane and in some specimens the embolium, claval suture, hemelytral suture and a median longitudinal line of pronotum are yellow. Limbs and ventral side of body yellow except basal abdominal segments which are usually dark. Pale bars on pronotum usually five when distinguishable.

Structural characteristics: Head with faint median carina between rows of impressed dots. Similar row of dots bordering the inner margin of the eye. Interocular space narrower in male than in female and vertex prominent. Pronotum and clavus coarsely rastrate. Membrane shining and mottled with pale blotches. Metaxyphus broad and short. Pala of female of usual form but depressed on back side; that of male greatly thickened and carinate on back side. Face of pala in male provided with row of 21 or 22 pegs; distal margin of pala thin and bent anteriorly (see Fig. 7). Male strigil transverse and provided with about 5 striæ. The so-called face of the head in both sexes long and slender.

Described from a series of 25 specimens, 7 females and 18 males, taken by the writer from Nigger Creek, Mullett Lake, near Topinabee, Michigan, and a small series taken from the St. Croix River, N. B., on October 23, 1893, by W. C. Kendall. The latter series belongs to Cornell University.

Holotype and allotype in University of Kansas collection. Paratypes in Cornell collection.

Comparative notes: This species in general appearance reminds one of *Arctocorixa hydatotrephes* Kirkaldy but is readily separated from that species by the thickened and carinate male pala and by the very different shape of the male genital capsule and claspers.

Bibliography.

1. **Hungerford, H. B.,** 1924. A New Mesovelia with some Biological Notes Regarding It. (Hemiptera-Mesoveliidae) Can. Ent., June, pp. 142–144.
2. **Hungerford, H. B.,** 1924. A Second New Mesovelia from the Douglas Lake, Michigan, Region. (*Mesovelia cryptophila* sp. new.) Ann. Ent. Soc. of America, Vol. XVII, pp. 453–456.
3. **Hungerford, H. B.,** 1924. Stridulation of *Buenoa limnocastoris* Hungerford and Systematic Notes on the Buenoa of

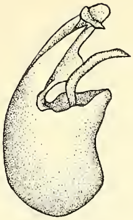
the Douglas Lake Region of Michigan, with the Description of a New Form. Ann. Ent. Soc. of America, Vol. XVII, No. 2, pp. 223–227, June.

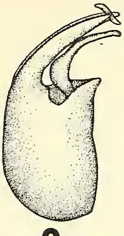
4. **Hussey, Roland F.**, 1919. The Waterbugs (Hemiptera) of the Douglas Lake Region, Michigan. Occasional Papers of the Museum of Zoology, No. 75, University of Michigan, Ann Arbor, Michigan. Published by the University.
5. **Hungerford, H. B.**, 1926. Some Notonecta from South America. Psyche, Vol. XXXIII, No. 1.

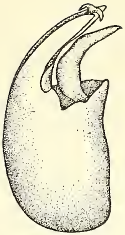
PLATE XIII.

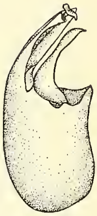
NEW CORIXIDAE FROM NORTHERN MICHIGAN.

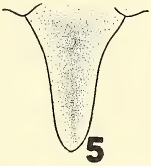
Arctocorixa decoratella sp. n.
  Fig. 3. Male genital capsule.
  Fig. 14. Male pala.
Arctocorixa douglasensis sp. n.
  Fig. 1. Male genital capsule.
  Fig. 5. Metaxyphus.
  Fig. 8. Male pala.
Arctocorixa macropala sp. n.
  Fig. 6. Metaxyphus.
  Fig. 9. Male genital capsule.
  Fig. 11. Male pala.
Arctocorixa minorella sp. n.
  Fig. 10. Male pala.
  Fig. 12. Male genital capsule.
Arctocorixa michiganensis sp. n.
  Fig. 15. Male pala.
Arctocorixa solensis sp. n.
  Fig. 4. Male genital capsule.
  Fig. 13. Male pala.
Arctocorixa variabolis sp. n.
  Fig. 2. Male genital capsule.
  Fig. 7. Male pala.

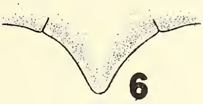

1

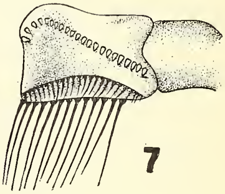

2

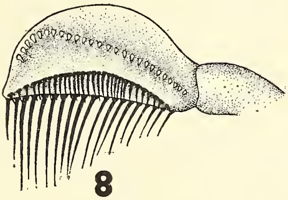

3

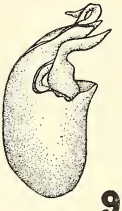

4

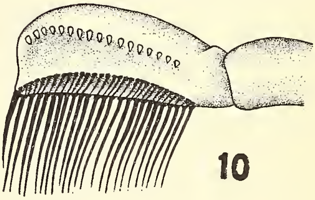

5

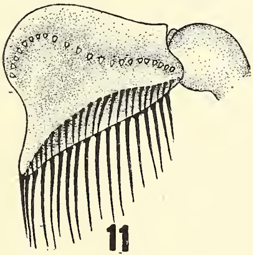

6

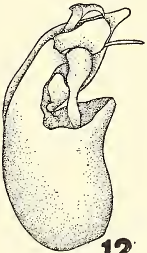

7

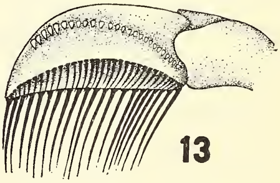

8

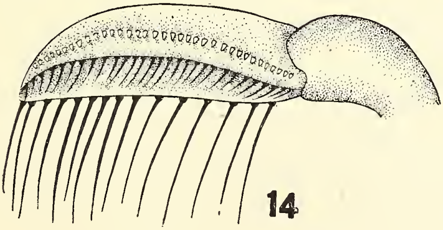

9

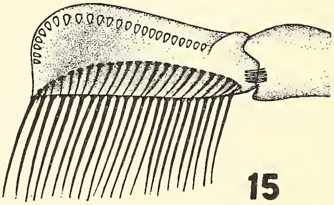

10


11


12


13


14


15

COLLECTING NOTES FOR LONG ISLAND, NEW YORK.

By E. L. Bell, Flushing, N. Y.

During the spring and early summer of 1926 there was a great scarcity of butterflies and the collecting therefore very poor in my usual collecting grounds, a condition, judging from reports from friends in other localities, by no means confined to this region. The reason for the scarcity is, of course, a matter of conjecture; however, the abnormally cold and rather dry spring, conditions which continued well into June, probably contributed towards it, the effect of the cold weather being particularly noticeable in the late appearance of those species usually on the wing early in the season.

Towards the end of July, butterflies began to appear in much greater numbers, in some species the numbers were amazing, especially *Cynthia atalanta* Linnaeus, *Cynthia virginiensis* Drury and *Cynthia cardui* Linnaeus; *cardui* is usually quite scarce, except in certain years, but even in those years of abundance of individuals, the writer does not recall having ever seen so many as this year.

As an illustration of the increase in numbers in late July, on the 31st of that month the writer collected, in two hours, a large number of specimens, nearly all on the flowers of the button-bush, in a very restricted area, these comprised twenty-eight species, most of which were common species, but the following are probably worthy of note: *Poanes viator* Edwards, sometimes fairly common in other localities, are the first specimens taken by the writer at this particular locality in several years; one male *Celtiphaga clyton* Boisduval and LeConte, the second specimen taken by the writer in several years, it was feeding on the sap from a small wound in an oak, in company with *Hamadryas antiopa* Linnaeus, *Cynthia atalanta* Linnaeus and *Polygonia interrogationis* Fabricius; a single male *Eurymus eurytheme* form *amphidusa* Boisduval is also the second specimen taken by the writer, at Flushing, and another individual was seen but not captured, it may be that this insect occurs more often on Long Island than is generally supposed, though probably not in great numbers, and is misidentified on the wing for *Eurymus philodice* Godart, which it resembles. The flight is somewhat different from that of *philodice,* and the reddish tinge of the upper surface readily separates it from that species.

Another record worthy of note is the capture of four males and one female *Lemonias harrisi* Scudder at Flushing, on June 20, and two others were seen but not taken; the only other record for this species on Long Island, known to the writer, is that of one specimen taken by Mr. Geo. P. Engelhardt, at Woodhaven, on June 19, 1926; the specimens collected by the writer were taken in a locality where he has collected for several years and Woodhaven is also a well-known collecting place to Brooklyn collectors. It therefore seems somewhat strange that this species should suddenly appear on Long Island, in two places which have been well collected over, as it is too conspicuous an insect to have escaped notice all these years, nor does it seem possible that it has heretofore been consistently misidentified for the common *Phyciodes tharos* Drury, which it resembles on the upper surface.

NOTES ON ABERRATIONS OF NEW JERSEY BUTTERFLIES.

By C. Rummel, Newark, N. J.

Phyciodes nycteis Dbldy., ab. **millburni.** One female specimen taken at Millburn, N. J., June 28, 1920—in collection of C. Rummel.

This aberration differs from normal *nycteis* in that the light brown spots and small patches at the base of primaries are all absent but two and replaced with black, while on the limbal area the black border is greatly reduced and replaced with light brown. On the secondaries all the light brown at the base and discal area is absent and replaced with black, doing away with the black transverse band completely. The broad brown band in the limbal area is normal. The six little black dots in this brown band on normal *nycteis* are replaced with pale yellow dots with a black half circle over the outer four. On the under side the silvery white at the base is replaced with light brown where the brown border patches and eye spots are replaced with one large patch of silvery white.

(*To be continued.*)

BOOK NOTE.

Heteroptera or True Bugs of Eastern North America. By W. S. Blatchley. The Nature Publishing Co., Indianapolis. 1926.

At the bottom of page 1116 of this extensive manual appears this sentence: "Date of publication of this volume, October 18, 1926." The copy sent to me by Dr. Blatchley was mailed on or about October 19. This is an unconventional beginning for this notice, but since thirty-three new species or varieties are described therein, it is material that the date of publication be emphasized.

In the 1116 pages of this work, Dr. Blatchley treats 1253 species of Heteroptera from the Eastern United States, where the Hemiptera of Connecticut refers only to 765, a very great increase.

This is merely a preliminary notice, as it is impossible to properly evaluate the book without careful study. Some of Dr. Blatchley's conclusions will doubtless be strongly debated as soon as various specialists have had opportunity to go over their several groups in more detail. At the moment, it should be pointed out that Dr. Blatchley categorically states (p. 5) "this manual has been prepared mainly for the use of the tyro and not of the specialist who has a large library at his command." These words establish the criteria by which it must be judged. On this basis, it is an excellent piece of work, quite comparable to "*Beetles of Indiana*," and destined to be quite as useful to the non-specialist amateur. For this reason, equally, the comment may be made that new species should have appeared elsewhere, in current journals. These naturally appeal more to specialists and should, as I see it, have been referred to them rather than to a general public not competent to pass on them.

There are 12 plates and 215 figures, some original, others from various sources, all properly credited. They have been well chosen and in general illuminate the text. In this respect, the work is a distinct advance, even on other manuals.

From my point of view, too much reliance is placed on color, but the keys in general indicate the critical structures, so that little difficulty should be experienced in locating species. On the other hand, the new species, in my prejudiced view, should have had more attention paid to structural details.

In comparison to Saunder's British Hemiptera, this work maintains a higher level; it deals with a much greater number of species, and seems better planned.

Whatever opinion may be held of Dr. Blatchley's book, hemipterists, whether specialists or pure amateurs, will need it in their libraries. It completes the Hemiptera of Connecticut, and, of course, being the work of one man, it is homogeneous both as to construction and intent.

Dr. Blatchley is to be congratulated on such an important contribution to the knowledge of my favorite group, and thus rounds out a series of excellent and useful manuals, a life-work of no inconsiderable importance which carries with it its own reward in the standing in entomology that is his.—J. R. T. B.

DIAMESA (PSILODIAMESA) LURIDA GARRETT (CHIRONOMIDAE, DIPTERA).

By O. A. Johannsen, Ithaca, N. Y.

This species was described in 1925 from a single female specimen taken by Mr. Garrett at Cranbrook, B. C. I have a male and two female specimens which were collected in July in the Yellowstone Park. In its yellowish coloring and banded legs the male does not differ from the female. The hypopygium is yellow, the claspers somewhat resemble those shown in figure 9, plate 40 (Malloch, Bull. Ill. State Lab. N. H. 10: 1915) though a little more clavate, with mesal cilia and a dark brown subapical tooth. The eyes are bare, hemispherical, not emarginate at the base of the antennae; front over half the transverse diameter of the head; the antennae are not plumose but in structure like those of the female, the basal segment, usually hidden in the Chironomidae, is small, disc-like, the second (the so-called first) is more or less globular and of moderate size, the next four about as broad as long, of decreasing diameter, the last one (so-called sixth) about twice as long as the one preceding and with two apical hairs; palpi longer than the antennae, four segmented, fourth segment about as long as the second and third combined. The fore basitarsus is about 0.7 as long as the tibia; the fourth segment obcordate on all legs, but little over half as long as the fifth; claws simple, empodium vestigial, pulvilli wanting. The costa, radius, basal section of the cubitus, and the cross-veins are heavy; the media and the branches of the cubitus very delicate, the base of the former almost invisible. Length of specimen in alcohol, 3.5 mm.

PROCEEDINGS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

(*Continued from p. 172.*)

The gradual but constant lowering of the river beds naturally has been accompanied by a corresponding lowering of the underground streams, many of which in place of deepening their old beds have cut out new channels at lower levels, thus accounting for the presence of three main cave avenues, disposed in vertical layers, determined by the drainage levels of former geological times.

The uppermost caves located just below the sandstone stratum upon the limestone rock usually are quite dry and have very few crystal formations. Generally also they are devoid of organic matter of any kind and therefore are not a suitable environment for animal life.

The middle cave level contains avenues which are moist or dripping and it is in these that the most beautiful and elaborate formations of stalactites and crystals are found. They are also the favorite abiding places of fungi, of insects and of arachnids of various kinds. The third and lowest series of caves is at or only slightly above the level of the river drainage, which is from 200 to 300 feet below the surface of the table land. These caves are the newest in formation and give exit to underground streams, subject to the same rise and fall as the rivers outside. Blind fish and crustaceans live in the pools and streams of the lower caverns.

Regarding the animal and plant life in these caves evidence strongly points to recent origin, in all probability not earlier than the glacial time. The glacial period, while not quite extending to the cave regions of Kentucky, nevertheless must have affected profoundly the climatic conditions and the external life from what they are now. The general character of the cavern life indicates that it has been derived from the present fauna.

Caves visited by Mr. Engelhardt include Mammoth, New Entrance, Great Onyx and Crystal Caves in Kentucky and King Solomons, Soldier and English Caves in Tennessee. In the Mammoth Cave district commercial exploitation greatly interferes with the activities of the collector, at least during the tourist season when hundreds of visitors are being herded through the caverns daily. The caves in Tennessee, on the other hand, are rarely entered and much of the material collected was obtained there.

By way of illustration Mr. Engelhardt exhibited the Brooklyn Museum's systematic collection on cave life, including both vertebrate and invertebrate animals. He also showed a collection of European cave beetles, indicating a richer fauna in the old world caverns than in America. About sixty lantern slides, dealing with cave formations and the topography and conditions of the regions visited, served to illustrate Mr. Engelhardt's talk.

Meeting of April 16, 1925.

President W. T. Davis in the Chair and 10 members present.

Mr. Torre-Bueno reported for the Publication Committee on the cost of the Bulletin in relation to the finances of the Society and stated that the Bulletin for 1924 contained approximately 210 pages, the cost of which, to the subscribers, compared very favorably with other entomological publications, which he compared with our Bulletin, giving cost per page to subscribers; that the index was one of the heaviest expenses in connection with the Bulletin and that he thought it would be well to limit the Bulletin to a more reasonable size.

Mr. Davis reported having seen the dragon-fly *Anax junius* Drury on April 15, on Staten Island, though he had seen it numerous on Staten Island on March 29 and 30, 1907, an early date for the species; and *Pieris rapae,* the cabbage white, in numbers on April 1 also on Staten Island.

Mr. Torre-Bueno read his paper " On the American Species of Hydrometridae with Exhibition of New Species."

Dr. Hussey stated that at present there was only one genus in the Hydrometridae, and that he had received a specimen of a new species in this family from Honduras, which differed generically from any known species; he showed an unfinished drawing of the specimen.

Mr. Davis remarked on his new genus *Magicicada,* erected for the seventeen-year *cicada,* and showed specimens of this species and of the genera *Okanagana* and *Tibicina,* illustrating the differences in the three genera.

Mr. Engelhardt remarked on a letter he had received from Mr. Wiley Oakley, Gatlinburg, Tennessee, who acts as guide in that region, which is more or less inaccessible on account of poor roads, and suggested the interesting possibilities of the collecting in this territory where but little collecting has been done. Mt. Leconte, one of the mountains of this locality, has an elevation of about 6,000 feet.

Mr. Schott showed the nest of a wasp, probably *Vespa maculata* Linnaeus, made in and around a bird-house.

Meeting of May 14, 1925.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, May 14, 1925, at 8.30 p. m.

President Davis in the Chair and seven members present, also two visitors.

Mr. Engelhardt spoke of having another letter from Mr. Wiley Oakley, Gatlinburg, Tennessee, the Smoky Mountain region, which he read to the Society. Mr. Oakley expressed his desire to have collectors come to his place, he said that his charge for guiding was $3.00 per day whether one person or a party, one of the hotels in Gatlinburg charged $2.00 per day or $2.50 per day for room with a bath, the other hotel charges $1.50 per day, these hotels are open all winter.

Mr. Bell exhibited a box of moths collected on the electric-light poles and tree trunks at and in the vicinity of Flushing, during the latter part of April and the first part of May; he also reported finding a pair of *Papilio troilus* Linnaeus in copulation on April 26 and one individual of *Epargyreus tityrus* Fabricius on the same date at Flushing.

Mr. Engelhardt also showed some specimens similarly collected, among which were the following collected at Queens, *Psaphida resumens* Walker collected on April 4, *Euthyatira pudens* Guénée, *Baileya dormitans* Guénée, collected on April 26; also several beetles, *Ceruchus piceus* Britton, found in a rotten sweet-gum log at Queens. Smith's Insects of New Jersey says of *piceus,* " Throughout the state; common in rotten beech all the year round."

Mr. Davis exhibited a box of *Balaninus* beetles from Dr. F. H. Chittenden, these included *Balaninus proboscideus* Fabricius, the chestnut beetle, now probably extinct on Staten Island and Long Island.

Mr. Torre-Bueno proposed that Mrs. Slosson be made an Honorary Member of the Society, duly seconded and carried; Mr. Davis said that he would write to her notifying her of the action of the Society and also congratulate her on her birthday.

Mr. Engelhardt spoke on the " Clematis Root Borers of America North of Mexico " and exhibited specimens.

Mr. Doll exhibited a considerable number of specimens of moths collected at Banff, Alberta, by Mr. Carl Rungius and pointed out many rare species as well as some which he was unable to identify and which may be new to science; the specimens were collected mostly on the street lights at night, the collecting being very rich in species as well as numbers.

ABERRATIONS
OF BUTTERFLIES
WANTED

WHEN SELLING A BUTTERFLY COLLECTION, IT IS ADVANTAGEOUS TO DISPOSE OF THESE ODDITIES SEPARATELY. THEY BRING GOOD MONEY. SEND ME A DESCRIPTION OR BETTER STILL, A SIMPLE PENCIL SKETCH OF YOUR SPECIMENS.

JEANE D. GUNDER, Pasadena, Cal.

COMSTOCK'S

Introduction to Entomology

The complete work includes Part I as issued in 1920, *revised* and Part II, devoted to the classification and the life histories of insects.

$6.00 Net

About 1044 pages
1228 Illustrations
Buckram Cloth Binding

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

List Nr. XIII
Gratis on Request, text English

All prices net in U. S. dollars. Contents **Lepidoptera, Coleoptera and other insects,** books, pins, etc.

Original Collection of Fassl: Heterocera (also Agrias) with many rarities, single ♀♀, types, etc.

We have the greatest store in the world of Lepidoptera, Coleoptera and other insects.

Dr. O. Staudinger & A. Bang-Haas
Blasewitz, Dresden, Germany

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147 Butterflies for trays,
192 All glass mounts,
205 North American Lepidoptera,
249 Exotic Lepidoptera,
212 Insect pests, Summary of collections,
213 Exotic Coleoptera,
214 North American Coleoptera,
234 Insect collections,
229 Life histories of insects,
254 List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
vol. 7 (new series)	4.00
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 01262 6636